883

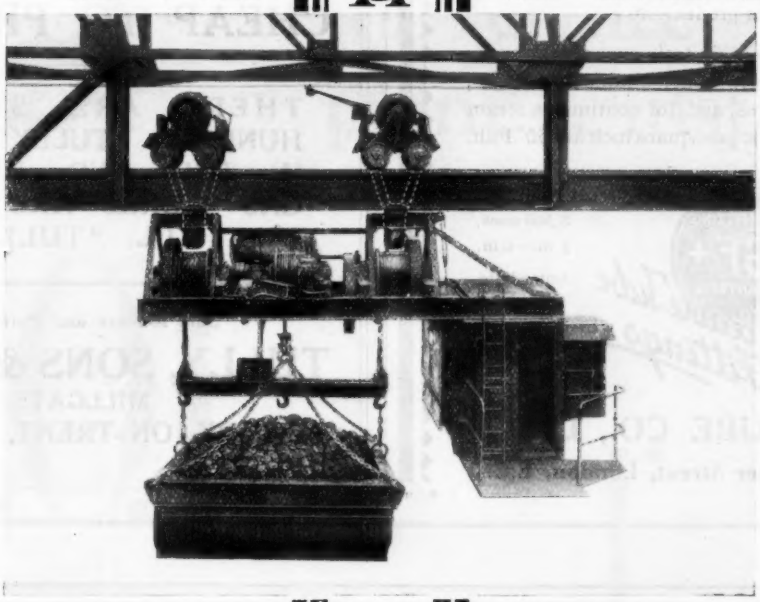
GAS JOURNAL

LIGHT . HEAT . POWER . BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. 202. 85th Year. LONDON, JUNE 28, 1933. No. 3658. Price 1s.

ELECTRIC ALL TYPES **TELPHERS** ALL CAPACITIES

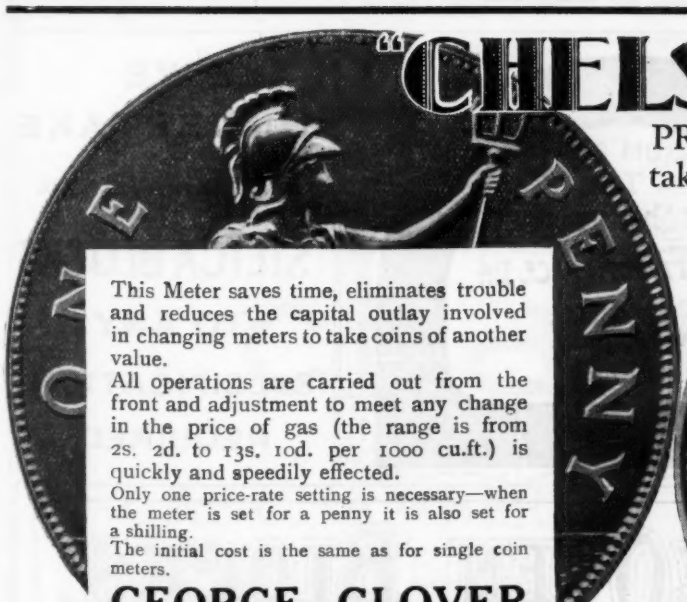


For Direct or Remote Control

For handling Coal, Coke, Oxide, etc., by means of Skips or Grabs.

The illustration shows a 7-Ton Gross Load, three barrel machine for handling coke from Intermittent Vertical Retorts.

STRACHAN WHITEHALL & **HENSHAW** LTD. BRISTOL



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PRE-PAYMENT METER
takes PENNIES and SHILLINGS

This Meter saves time, eliminates trouble and reduces the capital outlay involved in changing meters to take coins of another value.

All operations are carried out from the front and adjustment to meet any change in the price of gas (the range is from 2s. 2d. to 13s. 10d. per 1000 cu.ft.) is quickly and speedily effected.

Only one price-rate setting is necessary—when the meter is set for a penny it is also set for a shilling.

The initial cost is the same as for single coin meters.

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Every +GF+ Fitting is inspected and tested many times during the course of its manufacture.

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THE IDEAL GAS SUITED TO ALL MODERN NEEDS

ECONOMICAL IN USE AND CHEAP TO PRODUCE

THERE ARE SEVERAL HUNDRED "TULLY" PLANTS IN USE AND NUMEROUS GAS WORKS ARE SENDING OUT ALL "TULLY" GAS

Sole Makers and Patentees:

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SILICA RETORTS.

MINIMUM EXPANSION
The Oughtibridge Silica Firebrick Co., Ltd.
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Estd 1858.

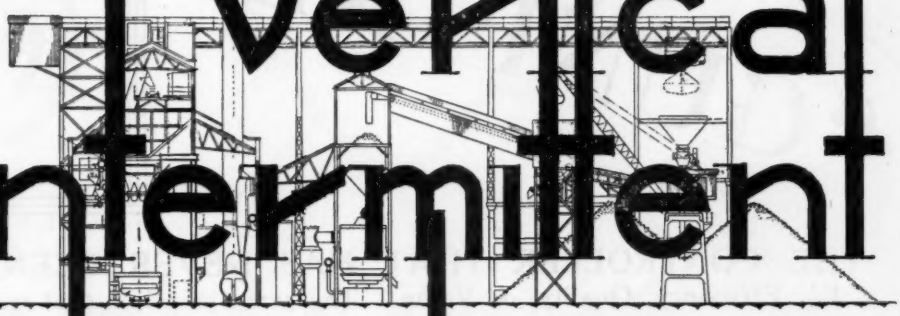
WE UNDERTAKE TO MANUFACTURE SILICA BLOCKS TO ANY SPECIFICATION REQUIRED.

COKE OVEN BLOCKS.

why not modernize your plant & install:—

C.O.L.

vertical intermittent chambers



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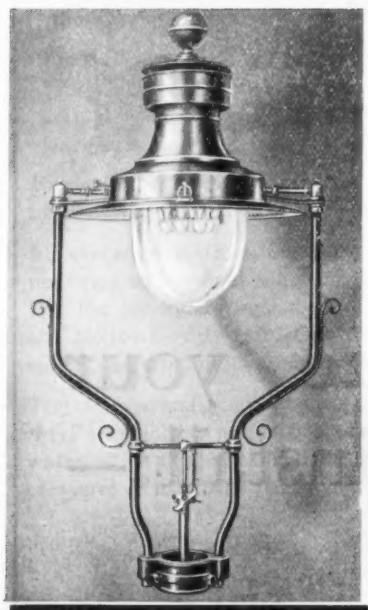
INCREASES THE ILLUMINATION OF "U"-FIXING LAMPS BY 200%



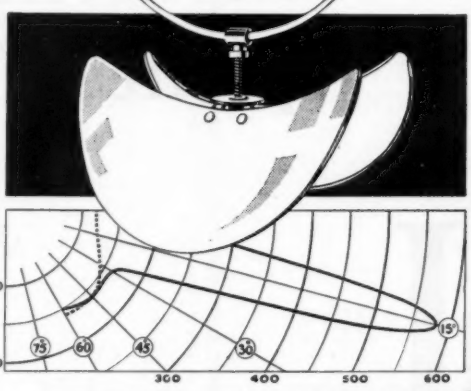
WITHOUT MOR-LITE REFLECTOR

A "U"-fixing lamp, without a MOR-LITE Reflector can only illuminate the smaller area within the dotted line shown on the graph chart

"PARKINSON"

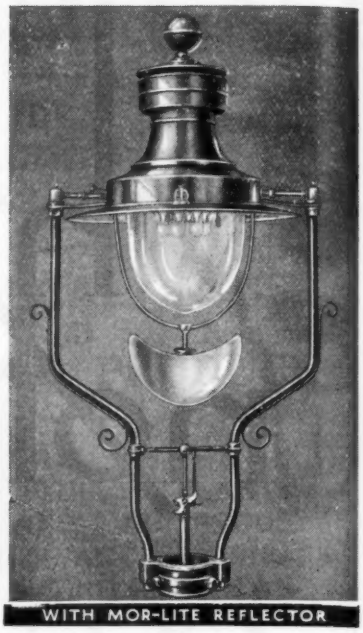
MOR-LITE

Here is a new MOR-LITE REFLECTOR which increases the illumination of "U"-fixing street lamps by 200% without increasing the cost of gas. The harp fitting is almost invisible and the wings are of highly polished STAYBRITE steel with adjustable clip and locking device.



..... WITHOUT MOR-LITE REFLECTOR
——— WITH MOR-LITE REFLECTOR . . .

GRAPH SHOWING POLAR CURVE COMPARISONS



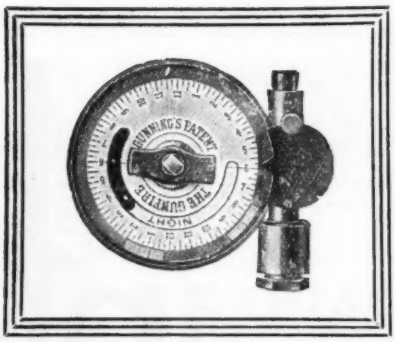
WITH MOR-LITE REFLECTOR

A "U"-fixing lamp with a MOR-LITE Reflector gives 200% increase in illumination as shown by the black line on the graph chart of test, and without extra cost.

W. PARKINSON & CO.
BIRMINGHAM

LONDON & BELFAST
INCORPORATED IN PARKINSON & COWAN (GAS METERS) LTD.

"GUNFIRE"



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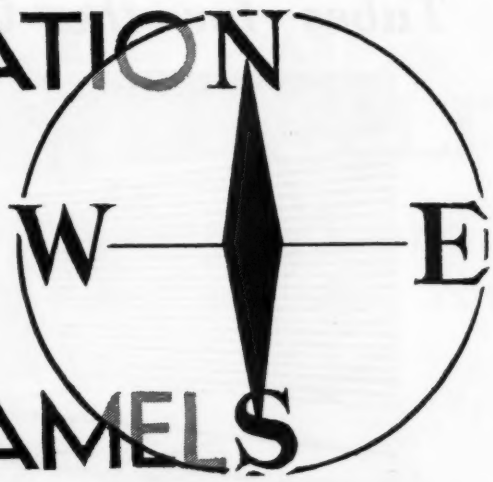

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"Constancy" is our watchword, and our linings, trays, and splash plates are noted for their excellence of quality, workmanship, and design.

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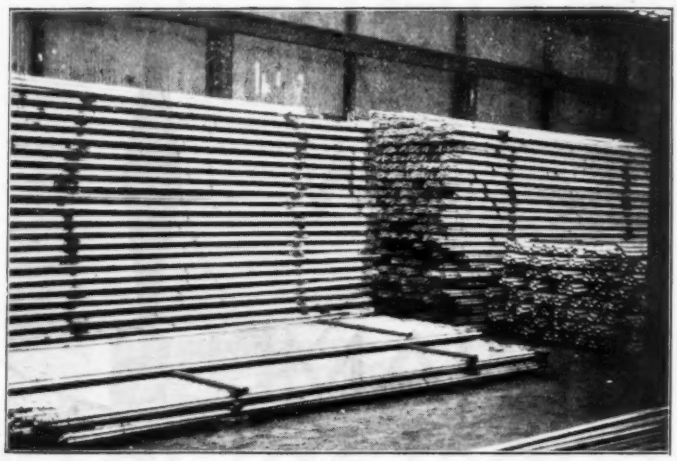

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WET and DRY GAS METERS,
STANDARD and HIGH CAPACITY METERS
STATION METERS, PRESSURE GAUGES, SYPHON PUMPS.
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1d. or 1s. or Two Coin.

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Supersede Fireclay!

"Everything for Safety Everywhere."

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To improve your plant and increase your output at less cost

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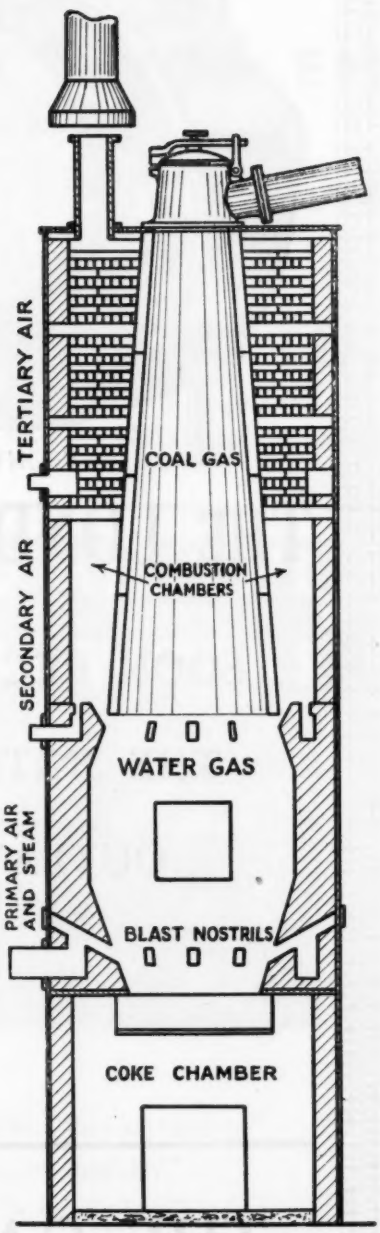
THE MOORE GAS PLANT

140 THERMS PER TON
QUALITY — 400 B.Th.U.

Mechanically operated
All the usual Residuals

You need equipment which will operate efficiently at low cost.

The MOORE plant will increase the efficiency of your gas making and will reduce your depreciation and maintenance charges.



Full particulars on application to the sole licencees and manufacturers

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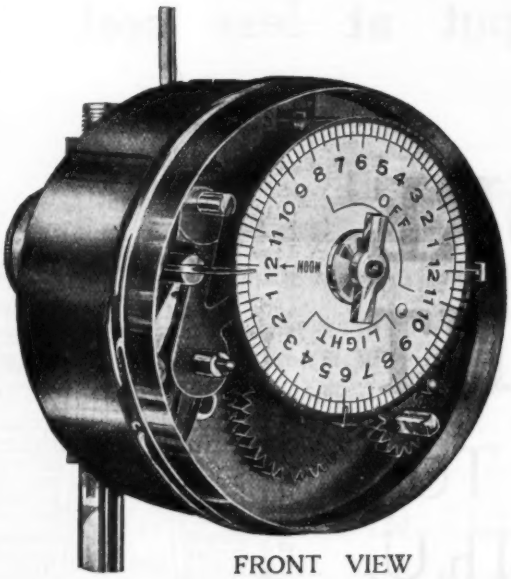
GAS DEPARTMENT, CALEDONIA WORKS, KILMARNOCK

It pays for itself!

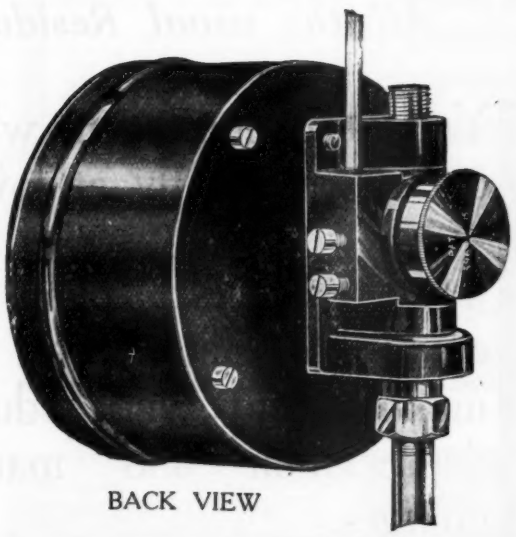


FRONT VIEW

THE ECONOMIES EFFECTED BY INSTALLING

THE LONDON CLOCK CONTROLLER

SOON RECOUP THE INITIAL OUTLAY



BACK VIEW

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ALL TYPES OF

WASTE-HEAT BOILERS

VERTICAL (COCHRAN)

AND

HORIZONTAL (WITH MECHANICAL INDUCED DRAUGHT)

YOUR HEAT RECOVERY PROBLEM

WILL HAVE OUR

CAREFUL TECHNICAL INVESTIGATION

ALL INSTALLATION WORK UNDERTAKEN

COCHRAN & CO. ANNAN LTD.

Head Office and Works—
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Telegrams: "MULTITUBE, ANNAN"

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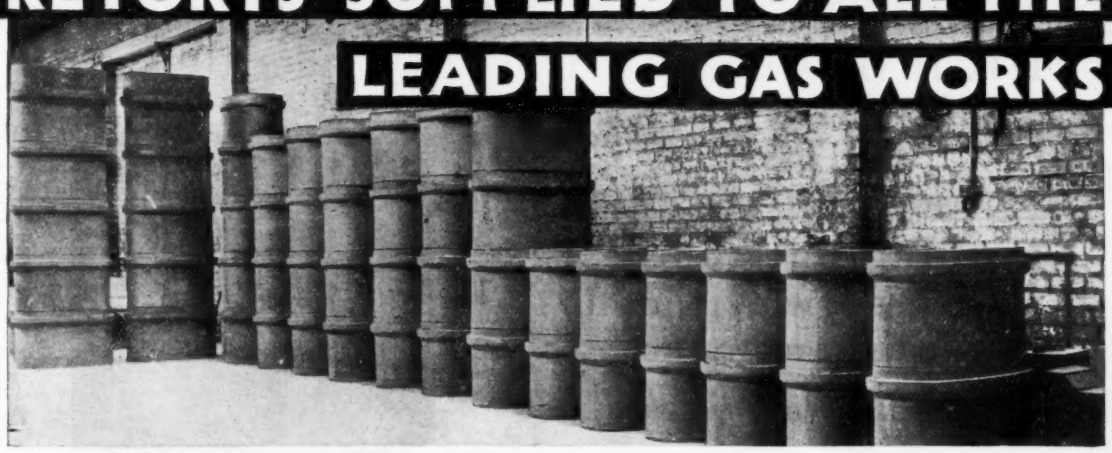
Telegrams: "MULTITUBE, SOWEST"

RETORTS SUPPLIED TO ALL THE LEADING GAS WORKS



Gas Managers tell you why

"Glenboig Retorts and Bricks have given complete satisfaction – indeed, they are faultless."
"Have found none superior." . . . . "Cannot be surpassed for durability." . . .
"Undoubtedly the best which have been used here." . . . . "By far the best." . . .

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GLENBOIG BRICKS

FOR ASSURED ECONOMY SPECIFY "GLENBOIG"

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Wilton

BRITISH

DESIGN

STAFF

PATENTS

Progress

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'Phones: Victoria 2417, 7091, 7092

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HIGH GRADE SLOT AND ORDINARY METERS

STANDARD & HIGH CAPACITY LISTS

Nothing but the best materials & workmanship used in their manufacture

Repairs—Parts supplied

R. LAIDLAW & SON (Edin.) Ltd.

SIMON SQUARE WORKS, EDINBURGH

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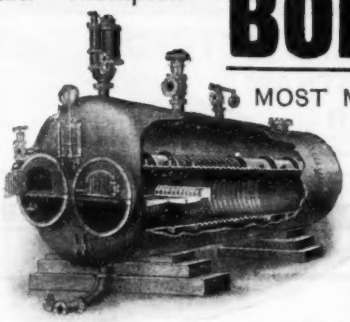
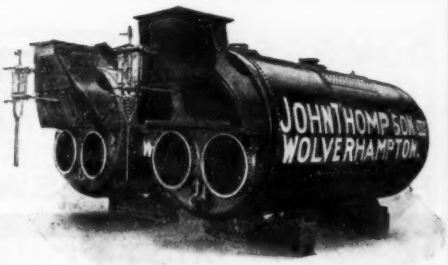
NEW "Thompson"

BOILERS

EX STOCK



MOST MODERN "DISH-END" TYPE
WITH CORRUGATED SECTIONS
Standard Sizes in Stock
ALSO
WATER TUBE, CORNISH
AND VERTICAL BOILERS
SUPERHEATERS AND PIPEWORK

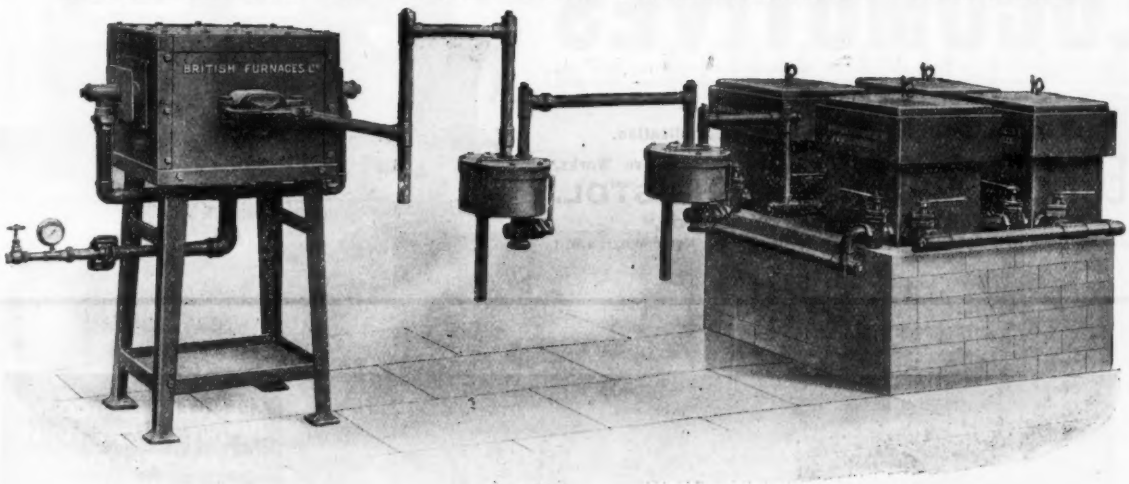


JOHN THOMPSON
"ECONOMIC"
BOILERS

JOHN THOMPSON (WOLVERHAMPTON) LTD.
WOLVERHAMPTON, ENG.

ASSAY PLANT

FOR THE
EVALUATION OF COAL FOR CARBONISING PURPOSES



Lay-out of Coal Testing Plant, showing Surface Combustion Gas-fired Furnace, Livesey Washers, and Purifiers.

WE SHALL BE PLEASED TO QUOTE FOR THE COMPLETE PLANT, INCLUDING WASHERS, PURIFIERS AND HOLDER, OR FOR THE FURNACE AND RETORT ONLY.

BRITISH FURNACES, LTD. DERBY ROAD, CHESTERFIELD

JOSEPH EVANS & SONS, (WOLVERHAMPTON) LTD.

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Telegrams: "Drysso, Westcent, London."

Please apply for Catalogue No. 8.

TRADE MARK.

Fig. 705 "SINGLE RAM STEAM-PUMP.

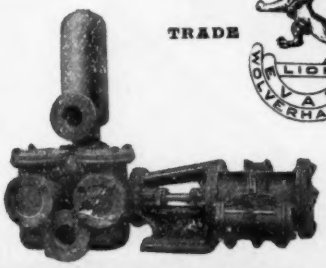

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

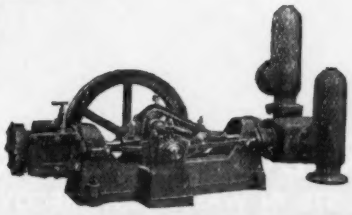

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

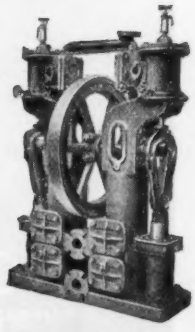

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

COMPRESSORS & EXHAUSTERS FOR AIR AND GAS.
See our Advertisement Next Week.
REAVELL & CO. LTD. IPSWICH.

VALVES AND FITTINGS FOR GAS, STEAM AND WATER
WE SPECIALISE IN THE REQUIREMENTS OF ENGINEERS IN ALL THE INDUSTRIES.
BRITISH STEAM SPECIALTIES LTD.
Alfred Street, LEICESTER

INSULATING BRICKS — RECUPERATOR TUBES
Special semi-silica quality for Segmental Retorts
with no Expansion or Contraction at 1400° C.
HARRIS & PEARSON, LTD., STOURBRIDGE, ENGLAND

LOCOMOTIVES
LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in progress for early delivery.
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PECKETT & SONS, Atlas Locomotive Works, LTD., **BRISTOL.**
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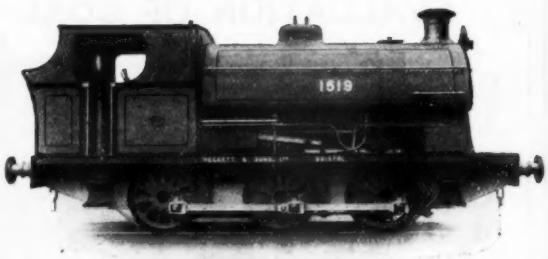

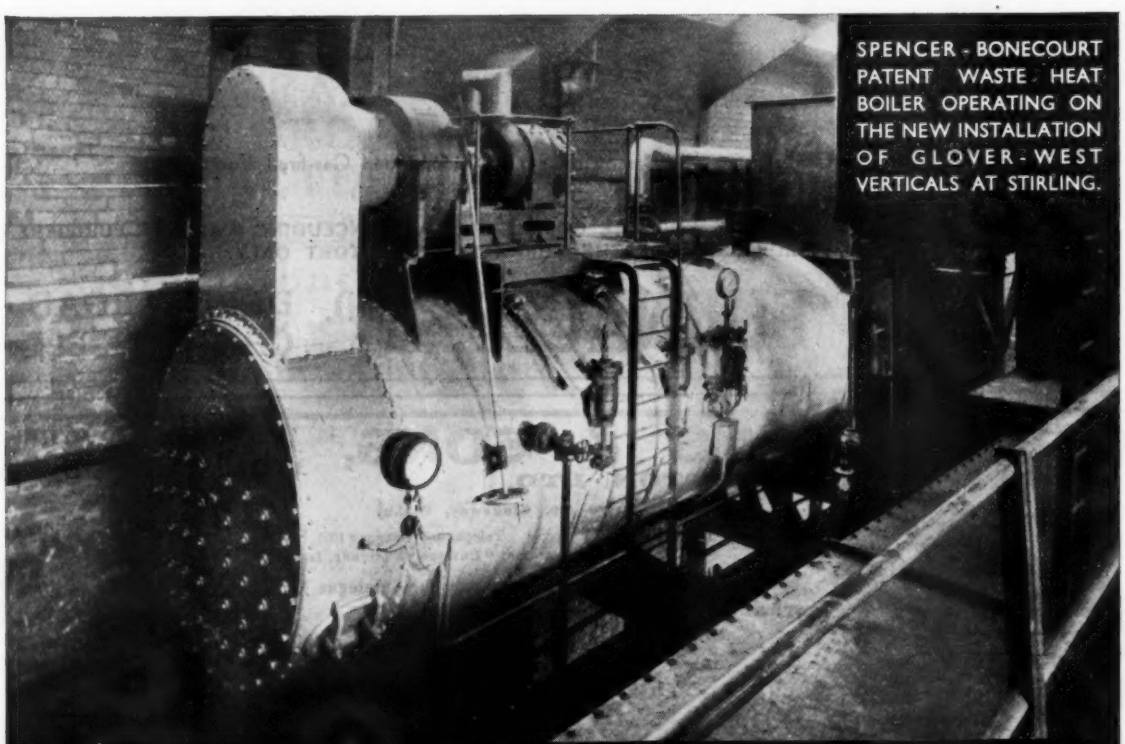
SPENCER - BONECOURT PATENT WASTE - HEAT BOILER OPERATING ON THE NEW INSTALLATION OF GLOVER - WEST VERTICALS AT STIRLING.
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AND 147 ST. JAMES ROAD, CROYDON.

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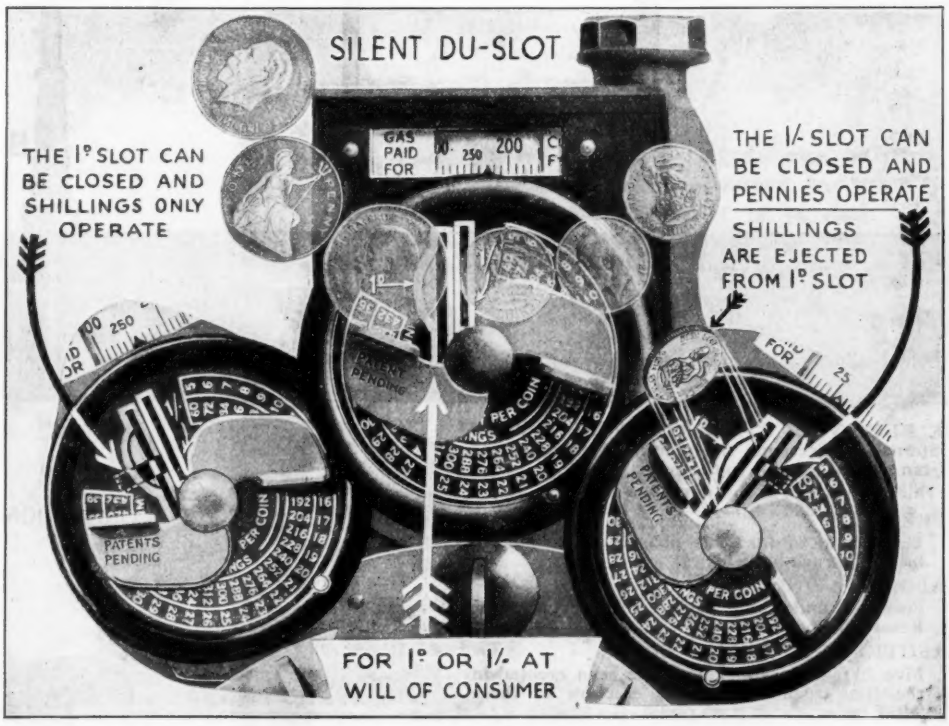
METERISTIC, BIRMINGHAM.
METERISTIC, CROYDON.

The "RADIAL DU-SLOT" is COMPREHENSIVE OF EVERY DISTRICT REQUIREMENT AND IS FOOL-PROOF!


SILENT DU-SLOT
THE 1° SLOT CAN BE CLOSED AND SHILLINGS ONLY OPERATE
THE 1/- SLOT CAN BE CLOSED AND PENNIES OPERATE
SHILLINGS ARE EJECTED FROM 1° SLOT
GAS PAID FOR
PATENTS PENDING
PER COIN
FOR 1° OR 1/- AT WILL OF CONSUMER

AN OPTIONAL COIN METER

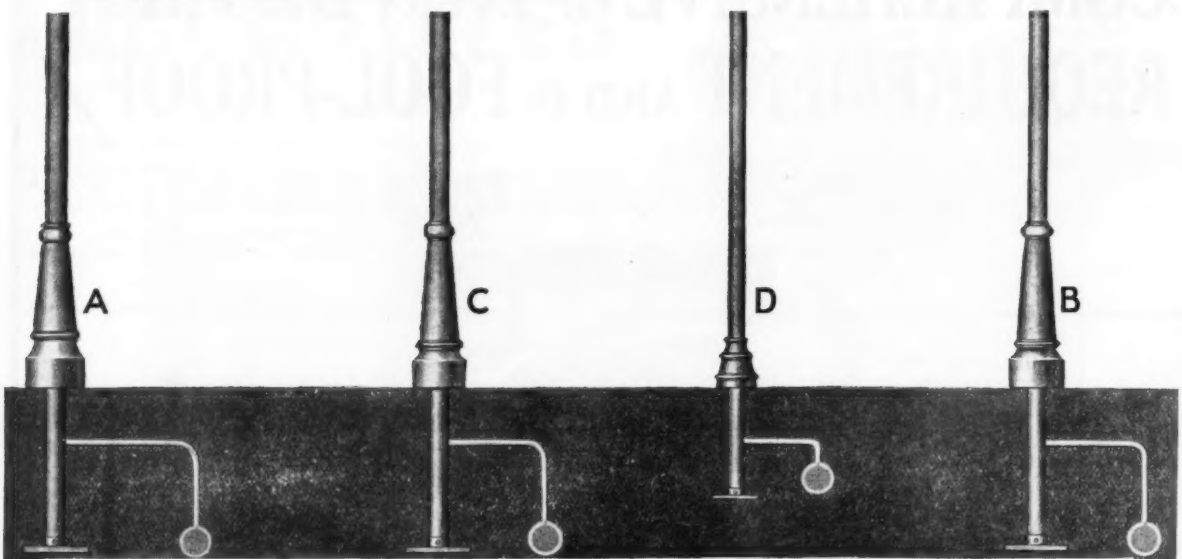
AND CAN BE USED FOR PENNY OR SHILLING AT WILL

THE TWO SLOTS INDICATE INSTINCTIVELY TO STORES, FITTERS, COLLECTORS AND CONSUMERS THAT IT IS A TWO-COIN METER

Consumers have COMPLETE CONFIDENCE to insert shillings where separate coin slots are provided

S&L

RESERVOIR GAS POLES



THE RESERVOIR STEEL GAS POLE abolishes all internal connections, the pole itself carrying the gas from the service pipe to the lamp.

The chief advantages of this new type are:

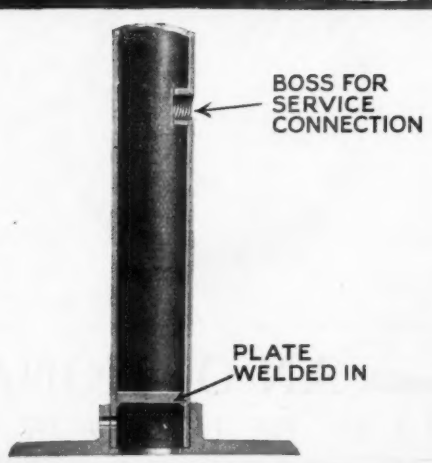
STRENGTH:
Being made of steel, the poles are not liable to break if struck by vehicles.

LABOUR SAVING:
Foreman and three men can erect a 20 ft. Reservoir Steel Gas Pole.

ERECTION TIME REDUCED:
Five 20 ft. Reservoir Poles have been erected in the time required for the erection of three 9 ft. 6 ins. cast iron lamp posts.

NO FROST TROUBLES:
There is no small internal piping to become stopped up during frost.

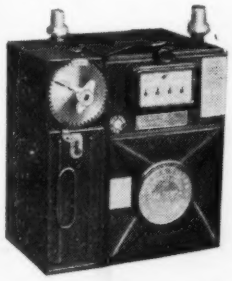
Write for our pamphlet "Reservoir Gas Poles" which gives fuller particulars.



STEWARTS AND LLOYDS LTD.

GLASGOW BIRMINGHAM LONDON

What's all this about unregistered gas?



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A NEW SERIES OF FOUR SIZES

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"NEW WORLD"
("REGULO"-CONTROLLED)
Gas Cookers

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THE RG. 125

THE RG. 325

The four new sizes of "Eureka" "New World" Gas Cookers recently introduced have been designed with generously proportioned ovens to afford ample facilities for cooking a complete dinner for a family.

With all the latest improvements, including the embossed door panel, easy-grip door knob and covered hinges, this series of cookers is already establishing considerable popularity among housewives who appreciate the advantage of a cooker on high legs to minimise stooping.

Made and finished with that high degree of perfection that has always been identified with John Wright products, these new cookers are worthy examples of all that is best in modern gas cooker design.

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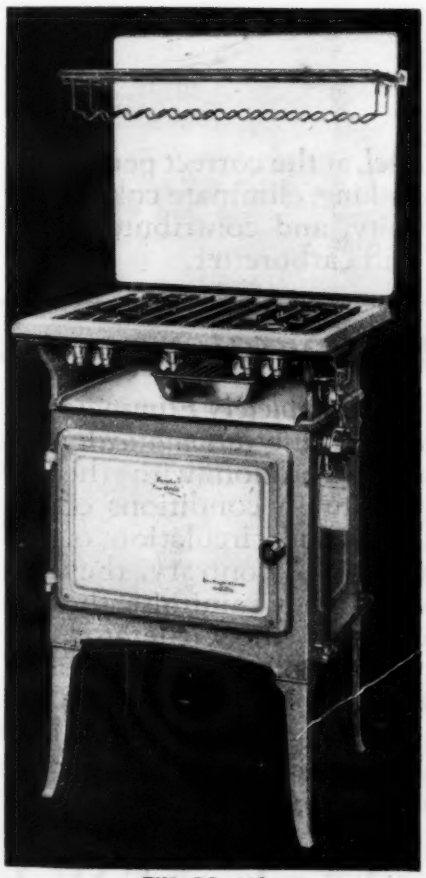
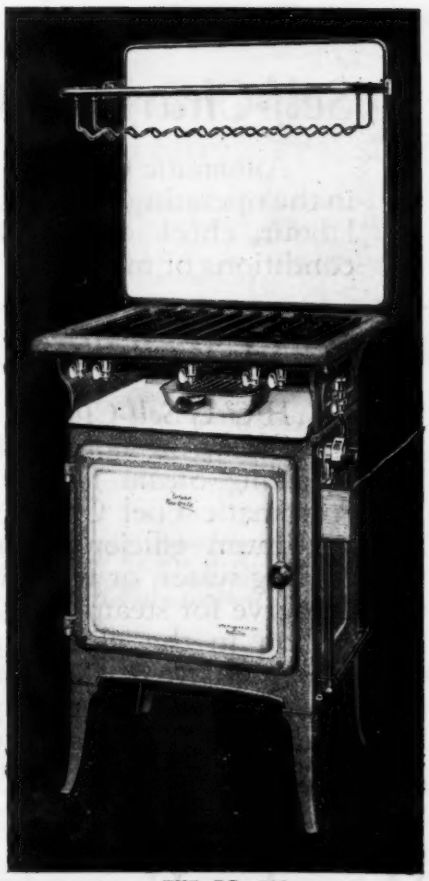


THE RG. 128



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Self-Steaming *Self-Charging*
Self-Operating *Self-Clinkering*

Carburetted-Water-Gas Plant

Self-Steaming Plant:—

By making "*waste-heat*" *Boilers* (of which they are now installing their 202nd example) a corporate part of H & G Plant, the Steam is produced without cost. Moreover, *in addition to saving ordinary boiler fuel and labour*, these "waste-heat" Boilers (unlike independently fired boilers) do not require house, setting, or chimney, or fuel and ash handling apparatus.

Self-Operating Plant:—

H & G Safety Automatic Operation eliminates gas-making labour, substitutes mechanical precision for human fallibility, minimises the cyclical extremes of temperature, improves the fuel and oil efficiencies, and increases the capacity of the Plant—*all while ensuring the Safety of the Process.*

Self-Charging Generators:—

Automatic Charging and Distributing of the Fuel, at the correct period in the operating cycle *without interruption of gas-making*, eliminate coking labour, check escape of "fliers," increase capacity, and contribute to conditions of maximum efficiency in generator and carburetter.

Self-Clinkering and Steaming Generators:—

H & G Self-Clinkering and Steaming Generators Completely Eliminate All Clinkering Labour, Tools, Trouble and Expense, while automatically providing Steam for use in the Generator. In co-operation with the Automatic Fuel Charger and Distributor, they maintain conditions of maximum efficiency throughout the fuel-bed, without circulation of cooling water, or waste of heat, water or steam; on the contrary, they conserve for steam production heat formerly lost. They minimise the carbon in the clinker automatically discharged from the Generator. They achieve perfect distribution of the generator air-blast and steam. They do not require periodical repairs to linings. *No fire-tools are needed; the fuel-bed is never disturbed.*

129 Patents Current or Applied for in the United Kingdom alone.

Humglas House, Carlisle Place, London, S.W.1.

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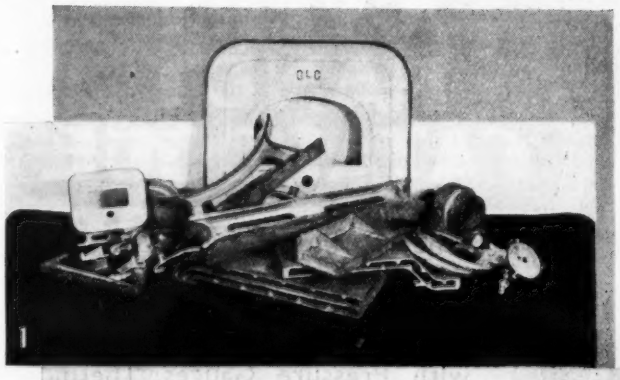

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high thermal conductivity, lightness and corrosion resistance

Amongst the multitude of applications of aluminium in the gas industry, it is interesting to note some of the uses made of the metal by the Gas Light & Coke Co. Here are three groups of aluminium castings.

(1) Industrial gas plant parts, furnace ends and cradles; lamp rings, flue pipe ends, panel heaters, and various brackets and supports

(2) Various clamps and fittings used in testing of gas apparatus components.

(3) Die-stock bodies, open sleeve, sleeve for protection of pipe joint (closed), miscellaneous number plates, pipe bender and cover.

A new data book has just been published by the B. A. Co., entitled "Aluminium in the Gas Industry," No. 354. You are invited to write for a free copy.

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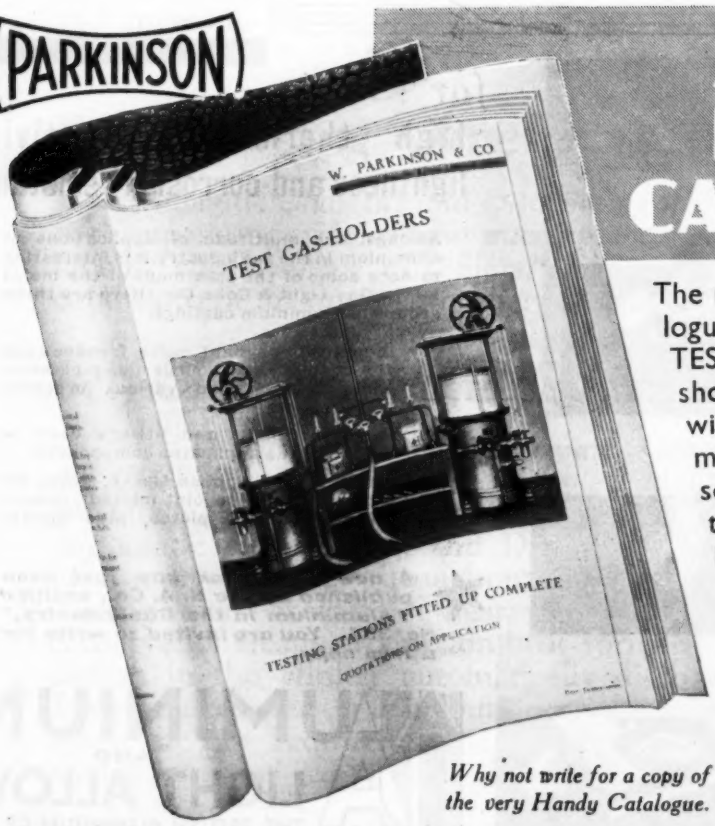

A VERY HANDY CATALOGUE

The new Parkinson Loose Leaf Catalogue contains 4 pages dealing with TEST GAS HOLDERS. Here is shown a twin equipment complete with Pressure Gauges, Thermometers, Gun Metal cocks, accurate scale, also series of side weights to enable tests to be made in accordance with the Sales of Gas Act.

Throughout the Kingdom Parkinson Test Gas Holders are giving reliable, trouble-free service.

Why not write for a copy of the very Handy Catalogue.

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LONDON S.W.1.

THE GAS JOURNAL

JUNE 28, 1933

Vol. 202. 85th Year No. 3658

A Glance at the Contents—

Gas Measurement in Europe.

In an illustrated article, a contributor compares gas measurement practice in Europe with American methods. [p. 918.]

Presidential Address of Mr. G. Braidwood.

We publish to-day the Presidential Address of Mr. George Braidwood, of Coatbridge, before the Waverley Association of Gas Managers at Edinburgh on June 23. [p. 925.]

Midland Coke Research Committee.

In the Report for 1932 of the Midland Coke Research Committee details are given of the Committee's progress during the year, including tests in an experimental coke oven, coke sampling, and laboratory work. [p. 916.]

Field's Analysis.

A perusal of the contents of Field's Analysis for 1932 provides the keen student with a definite measure of the trend of events in the Industry; and a summary of the more important features of the issue is published. [p. 907.]

Manchester Association at Nottingham.

On Friday last the Manchester District Association of Gas Engineers and Managers visited the town of their President, Mr. George Dixon, of Nottingham. During the morning a visit was paid to the Basford Gas-Works of the Nottingham Corporation. After being guests of the Corporation at luncheon, members inspected the gas central heating plant at the Council House, and then enjoyed a drive to Wollaton Hall, where tea was served. [p. 913.]

Hydrogen Sulphide Removal.

The design of purifiers for the removal of hydrogen sulphide from town gas by means of iron oxide forms the subject of an interesting contribution this week. [p. 922.]

Whessoe Foundry and Engineering Company, Ltd.

The Thirteenth Annual Meeting of the Whessoe Foundry and Engineering Company, Ltd., was held on June 27, at 25, Victoria Street, S.W.—Mr. Harold G. Judd, C.B.E. (Chairman of the Company), presiding. [p. 935.]

High-Pressure Holder.

A high-pressure holder of a capacity of 250,000 c.ft. at 50 lbs. per sq. in. pressure has been erected by the Skipton Gas Department a mile distant from the works. The contractors were Messrs. Newton, Chambers, & Co., Ltd. [p. 917.]

South Metropolitan Co-Partnership Festival.

A very large attendance and a varied programme of sporting events and entertainments marked the occasion of the annual Co-Partnership Festival of the South Metropolitan Gas Company, held at the Crystal Palace on Saturday, June 24 last. [p. 933.]

Gas in America—1816-1933.

Recently a group of donors presented to the Baltimore Municipal Museum—formerly Peale's Museum—a painting commemorating Rembrandt Peale's use of gas for lighting his museum in 1816, as a result of a display of which Baltimore gained the distinction of being granted the first franchise for the supply of gas in America. In connection with the presentation, an address was delivered by Mr. Alexander Forward, Managing Director of the American Gas Association. [p. 914.]

Forthcoming Engagements

July 10.—I.G.E.—Meetings of Finance Sub-Committee, 2 p.m.; Finance Committee, 2.30 p.m.; Executive Committee of the Council, 3 p.m.; Benevolent Fund Committee of Management, 4.30 p.m.

July 11.—I.G.E.—Meeting of Council, 10 a.m.

July 12.—I.G.E.—Meeting of General Research Committee, 10 a.m.

July 19.—B.C.G.A.—Meeting of Executive Committee, 28, Grosvenor Gardens, S.W. 1, 12 noon.

July 20.—S.B.G.I.—Council Meeting at 2.30 p.m.

July 21.—MANCHESTER DISTRICT ASSOCIATION.—Visit to the Higginshaw Gas-Works, Oldham. Paper by Mr. Norman Hudson, Mirfield—"Observations on the Differential Charges of Gas for Distribution Purposes."

July 24.—I.G.E.—Meeting of Liquor Effluents and Ammonia Sub-Committee.

July 25.—I.G.E.—Meetings of Joint Research Committee, 10.30 a.m.; General Research Committee, 2.30 p.m.

Sept. 7.—NORTH BRITISH ASSOCIATION.—Annual Meeting in Paisley.

Nov. 7-8.—I.G.E.—Autumn Research Meeting.

1933 "JOURNAL" Directory.

Page 44. MAIDSTONE. F. Livesey, Engineer and Manager, retired.

EDITORIAL NOTES

Field's Analysis

ON a later page of this issue of the "JOURNAL" will be found an article dealing with the newest publication of "Field's Analysis," which covers the accounts for the year 1932. This is the sixty-fourth annual issue of this valuable work.

Mr. H. E. Ibbs, the Chief Accountant of the Gas Light and Coke Company and compiler of the Analysis, is to be complimented once again upon what must undoubtedly be considered the standard work of its kind of the Industry. In thus complimenting Mr. Ibbs, it must not be forgotten that he is supported in his arduous task by a very capable set of assistants, to whom must also be accorded a meed of praise.

Net Coal Cost

THAT there exists a demand in this country for at least one open firegrate burning solid fuel is obvious, and we think that this practice will continue. At present practically the whole of this demand is met by raw coal, which from every point of view is wrong when smokeless solid fuels quite satisfactory in use can be made by high-temperature carbonization at gas-works. We are aware of the argument that if the Gas Industry pays more attention and more money to the preparation of smokeless solid fuel its finances will suffer. We do not agree with the argument on the single ground that somebody will be prepared to satisfy the growing demand for a smokeless solid fuel, and if the Gas Industry is not so prepared, there will be an inevitable repercussion on its gas business. The whole picture would be different, of course, if it could be shown that complete gasification, and the distribution of a gas of low calorific value, made it possible to supply the consumer with a cheaper therm. For the moment at any rate there is every reason to believe that the choice of a calorific value in the 450-500 B.Th.U. region is financially sound.

And, after all, sound finance must be the governing factor. This is emphasized strongly by Mr. George Braidwood, of Coatbridge, in his Presidential Address to the Waverley Association of Gas Managers, published on later pages. His address is one of outstanding interest and value, and we like his insistence that thinking in terms of results per ton of coal, as distinct from therms sold, should be avoided. The net cost of coal figure should be stated per therm of gas sold, and not per ton of coal carbonized. As everyone knows, figures can be most misleading. Only a few years ago, for instance, it was supposed to be a matter for congratulation when the results of a year's working showed that more cubic feet of gas had been made per ton of coal carbonized than in the previous twelve months—a statement which, without qualification, is meaningless and may in fact represent worse, not better, management. Similarly statistics based on the net cost of coal per ton carbonized may easily be misleading. Often the best gross financial yield per ton of coal carbonized is accompanied by the worst net cost of coal figure per therm of gas produced. Mr. Braidwood pins his faith to maximum coal throughput as distinct from maximum yield of gaseous therms per ton of coal carbonized, and he puts forward a comparison of the working results of seven Scottish gas undertakings in support of his contention. To this comparison he adds the Maclaurin process, of which we have heard a good deal of late. His calculations show that the therm can be manufactured in vertical retorts, even working at low throughput of coal, making higher quality gas and industrial coke, at a lower cost than the Maclaurin process. And as for the results at Coatbridge, where coal throughput is the basis of operation, gas of 475 B.Th.U. per c.ft. is being made at a net cost of coal figure of 0·34d. per therm, or 0·14d. less than by the Maclaurin process. His figures also show that with the prices for coal, coke, and tar taken—and Mr. Braidwood's assumptions in this respect are quite legitimate—"the process giving the lowest thermal yield per ton can result in the best *net cost of coal per therm* figure, and this despite the fact that its gross financial return per ton of coal carbonized is lowest of all the works tabulated." Again, such a process gives a coke eminently suitable for domestic use—and "no results can be hoped for from an agitation against the burning of raw coal in domestic grates unless and until a plentiful supply of suitable smokeless fuel is made available."

Mr. Braidwood asks Scottish engineers operating continuous vertical retorts to depart from minimum coal throughput and maximum gas per ton ideas, and to give a trial to maximum coal throughput methods, paying particular attention to the quality of the smokeless fuel produced and net cost of coal. "By this method of carbonization of Scottish coals in vertical retorts," he asserts, "gas of higher thermal concentration can be manufactured with ease, and that dread, under which many of the maximum gas yield engineers live, of being unable to maintain their declared calorific values, is removed. . . . The theory that there should be no material reduction in the make of gas per ton in the manufacture of smokeless fuel by high-temperature methods finds no support when the financial results obtained at Coatbridge by maximum coal throughput methods are studied."

Better Service

THE first part of Mr. Braidwood's address is concerned with means for ensuring better service to the consumer, and hence increasing the Industry's competitive strength. The one aim of amalgamation and joint working—in fact, their only justification—is better service. And whatever may be said about the efficiency of the small undertaking—we know well how efficient many small undertakings are, especially from the point of view of manufacture—modern conditions demand buying power, and specialists in selling as well as in making gas. In this matter of specialization the small undertaking necessarily is limited, and certain loads must be lost because it is not in a position to tackle and solve the problems of economic gas utilization involved. The Gas Industry during the past decade has provided an excellent example of sound rationalization. What Mr. Braidwood asks is that this rationalization should be speeded-up in Scotland.

No one, we suggest, can quarrel with the ideas Mr. Braidwood puts forward. He would have Scotland divided into regions, each region being supplied by a gas grid. In the operation of these regional grids, the most efficient statutory undertakings in the arranged regions, in a position to afford supplies, would be given by the Board of Trade statutory powers over those regions in order to permit of the laying of the necessary grid mains. Smaller undertakings in the regions would then act as distributors. The managers of these works, relieved of their manufacturing duties and worries, would be in a position to concentrate their energies and interests on distribution problems and salesmanship—phases of our business often sadly neglected simply for the lack of time. Isolated undertakings outside the range of bulk supply mains would be brought under the financial control of larger and more efficient concerns, who would be in a position to purchase and market materials more advantageously.

Queen of the Midlands

THERE are many associated with the Gas Industry who have, on occasion, expended much energy, either by word of mouth or by the use of the pen, as the case may be, in pointing out the manifest advantages attendant upon visits by gas engineers and others to the works of

their colleagues. Now, if this course is, as it must be, of benefit when adopted by the individual, it seems no more than reasonable to assume that an extension of the idea so as to include Associations should also have something in its favour. This is what happened on Friday of last week, when the Manchester District Association of Gas Engineers paid a visit to the Midlands; the outing being an unqualified success.

It is true that the members of the Manchester Association did not arrive at Nottingham as the result of any such process of reasoning as is outlined above, but the argument need be none the less sound on that score, just as the evidence was none the less conclusive. The President of the Manchester Association, Mr. George Dixon, B.Eng., formerly of Lancaster, is now at Nottingham, and, he having been elected to the chair, it was really more or less in accordance with custom that there should be a visit to his works—even though these works were some way southward of the Association's area. Mr. Dixon has, in point of fact, become wedded to a " Queen of the Midlands." There may be other Queens of the Midlands, but at any rate Nottingham amply demonstrated last Friday the justness of her claim to so noble a title. She is a beautiful and a generous Queen, but as the possessor of such attributes she is naturally not unexacting. Opportunity was, indeed, taken by Mr. Dixon jokingly to warn his friends from the North that, in spite of hoary tradition, " Farther South " is by no means necessarily synonymous with easier conditions of work. Everywhere the Industry demands to-day the greatest and the best that is in those who are engaged in it; but Mr. Dixon finds, as all must find in like circumstances, pleasure and satisfaction in the giving of his greatest and his best in the service of this " Queen of the Midlands."

Oxide Purification

COMMENCING in the " JOURNAL " to-day is a contribution to the theory and practice of the process of removing sulphuretted hydrogen from town gas by means of iron oxide, and we feel sure that it will prove useful to our readers. It is obviously written by one who has an intimate working knowledge of oxide purification and an understanding of the various factors which make for the economic success or otherwise of the process. The author brings together within small compass the conclusions which have been arrived at by investigators to date, analyzes these conclusions, and adduces a formula for calculating purifier capacity. Speaking of the factors influencing the absorption of hydrogen sulphide by iron oxide, he points to the effect on the rate of reaction exercised by the nature and extent of the surface exposed per unit volume of purifying material, and by the ability of the surface to absorb moisture, and states that the influence of the surface predominates and masks the effect of the concentration of hydrogen sulphide in the gas on the velocity of the reaction. He passes on to consider the influence of temperature, calling attention to the differences in English and American practice in this regard, and of the humidity of the gas. In regard to activity of oxides, and the part which moisture content of the oxide plays, the author has much of value to impart, and it will be noted that in both respects he cites the advantages of manufactured oxides.

Having dealt briefly with the mechanism of the revivification process, the author explains his derivation of a formula for the calculation of purifier dimensions. Not all the factors which are operative can be taken into account. Among those which it is impossible to incorporate in a formula are the temperature and humidity of the gas, and the alkalinity and moisture content of the purifying material. Experience has shown that the greatest efficiency is attained when certain optimum values of these factors are maintained, and, therefore, the working conditions must always be so adjusted that these optimum values are realized. The remaining two factors—viz., concentration of hydrogen sulphide in the gas and activity of the material—however, can be taken into account, and a formula can be derived which expresses the relationship of these two factors to the ratio of the volume of material to that of the gas to be treated in unit time.

The author emphasizes that the figure determined by the formula he gives is insufficient to define completely the dimensions of a purifying plant, for a given volume of material can be disposed in an unlimited number of combinations of area and depth. In practice, choice in this respect is limited by considerations of the back pressure permissible in the plant and the ground space available. " Back pressure," he observes, " varies widely with different materials and with the physical condition and moisture content of any one material. It has long been known in practice, though rarely mentioned and never emphasized in technical literature, that the resistance to the flow of gas through purifying material, as indicated by the back pressure, is proportional to the first power of the linear velocity of the gas through the free space, and not to the square of the velocity, as is the case generally with flow through pipes. This is due to the fact that a mass of porous material behaves as a collection of fine capillary tubes, in which the flow is viscous. The resistance is therefore directly proportional to the volume of gas passing in unit time and to the depth of the material."

For purposes of design, it has generally been assumed that a nominal linear velocity of 1 to 2 ft. per minute should be aimed at. In plant practice a fairly wide choice for the cross-sectional area of purifiers is found, the value decided upon in a particular case being dependent upon the character of the material. Bog ores are generally of open texture, and no difficulty is experienced in realizing a nominal linear velocity of 2 ft. per minute. As a rule, manufactured materials offer a greater resistance to the passage of gas, and it is desirable to allow a larger area corresponding to the lower linear velocity of 1 ft. per minute. The author points out, however, that this can be effected by using boxes of the same dimensions, but dividing the flow of the gas in each box. The efficiency of removal of hydrogen sulphide is thereby in no way affected, since the time contact remains the same, but the area of cross-section of the material is doubled. This principle of dividing a box into a number of layers, with separate admission of the gas to each layer, is a comparatively recent innovation in purifier design, and is especially useful where the available ground space is limited. The latest development of the principle is exemplified in the tower purifier, where as many as fourteen layers have been employed. We believe that much more will be heard of the tower purifier in this country in the near future.

Pressure Storage

LAST week saw the inauguration of a type of holder new to this country, but which offers advantages in circumstances such as exist at Skipton. As far as we are aware this is the first large-scale attempt to provide high-pressure storage capacity in this country, and the Skipton Gas Department and their Engineer and Manager, Mr. N. B. Thompson, are to be complimented on their pioneer effort—an effort which was aptly described at the opening ceremony as a " bold venture, well conceived, and well completed." The structure has a diameter of 32 ft. and a length of 102 ft., is only 34 ft. high, and its capacity is 250,000 c.ft. at 50 lbs. per sq. in. pressure, or 75,000 c.ft. at atmospheric. The weight on foundations is only one-third that of a water-sealed holder of corresponding capacity—and, of course, the pressure holder is favourably placed in regard to maintenance charges. On the other hand, it will have to be debited with its just proportion of the costs of compression—though by no means with the total costs, for the holder makes possible the supply of gas to outlying villages, besides ensuring adequate pressures in parts already supplied with gas but remote from the works. Altogether the results of this experiment will be followed closely; and we have no doubt that in service the holder will live up to one's high anticipations of an engineering structure erected by Messrs. Newton, Chambers & Co., Ltd.,

PERSONAL

RETIREMENT OF MR. FRANK LIVESEY.

Mr. Frank Livesey, M.Inst.C.E., who has just relinquished his position, joined the staff of the Maidstone Gas Company in 1908, becoming Engineer and General Manager in 1911, and a Director of the Company in 1930.

Educated at Charterhouse and Cambridge, where he took his degree in Mechanical Science, he is the third generation of his family to have been engaged on the engineering side of the Gas Industry, his grandfather, Mr. Thomas Livesey, being appointed Secretary and General Manager of the South Metropolitan Gas Company shortly after that Company was formed by the amalgamation of several companies in South London. On the death of Mr. Thomas Livesey in 1858, the South Metropolitan Gas Company was controlled for many years by his two sons, the elder, Sir George Livesey, being Chairman, and the younger, Mr. Frank Livesey, the Chief Engineer. Under these two men, the Company became known for many engineering inventions and achievements, and also for several lasting social and legislative innovations, such as the sliding scale method of adjusting gas prices to gas profits and co-partnership, which has now spread to many other industries. Mr. Livesey is the only surviving grandson of the founder of the South Metropolitan Gas Company, his only brother being killed in action at the battle of Loos in 1915.

In an interview, Mr. Livesey said how sorry he was to leave his many good friends in and around Maidstone. During the twenty-five years of his stay in Kent, everyone had been so kind to him that it was with many regrets he was leaving this fine county.

On the evening of June 17, Mr. Livesey entertained the staff and workmen of the Maidstone Gas Company at dinner at the Corn Exchange, and Mr. F. A. Gulland (Secretary of the Company), in proposing his health, said they were met that evening to take their formal farewell of Mr. Livesey, who to their sorrow was severing his connection with the Company. Mr. Livesey's was an unusual retirement. It was true, that measured in length of service, Mr. Livesey's period of 25 years was small compared with many with which they were familiar, but he thought all would agree that those years were marked by considerable progress of the Company. It was not necessary to quote any statistics, for after all it would be a poor thing if they were to think of Mr. Livesey only in terms of therms. Mr. Gulland preferred to think that Mr. Livesey would be remembered for his personal and human qualities, his willingness to do the best for his workmen, the open ear for all their troubles, and his incapacity to do a mean action. These qualities would remain with them as a precious memory. It was natural that before Mr. Livesey left, they should ask him to accept some small token of their regard and esteem. They asked his acceptance of two entrée dishes, and they also asked Mrs. Livesey to accept a fruit dish. These gifts carried with them the best wishes of the whole of the staff and workmen for their future happiness.

Mr. Livesey, in reply, said that they had all very kindly drunk his health, and had made him a very handsome parting gift, and he hoped that this meant—he believed it did—that his time at Maidstone had been spent usefully. The work which had fallen to his lot had been very interesting and pleasant, and he had been fortunate in many ways. When he joined the Company's staff in 1908 he found an excellent General Works Foreman, and a good staff of young men of ability, and he had, therefore, been able to fill nearly all the positions that had become vacant from inside the Company's ranks. In 1908 electricity was only a young and healthy child, just cutting, as it were, its second teeth. As that child had grown, they too had been continually improving their service, and changing their methods of sale and distribution to keep in touch with the needs of the times. The selling side of their business had been developed and their standard of service greatly improved.

So much for the past, said Mr. Livesey. At the present time the Gas Industry was holding its own in the face of all competition. At no time had the name of gas, no doubt due to some extent to astatic advertising, stood so high in the public estimation. Large amalgamations, for better or for worse, had taken place in the electrical industry, and with the exception of one or two corporations, most of the electrical supply in Kent was under one control. They were therefore taking similar action, so that the best brains and the best equipment to meet the needs of any case should be available. But how would these amalgamations affect them? He believed that their interests had been reasonably safeguarded. In the published letter of the South-Eastern Corporation were these words:

> "This Corporation agrees that it will not interfere with the present superannuation scheme for the benefit of your Company's staff, and will not alter the present plan applicable to those members of the staff who are not included in the superannuation scheme, and provided that their work is satisfactory and health good, the existing members of the staff will continue to be employed."

They will, he sincerely believed, find that their conditions of employment were not worse than before; on the contrary, he expected that the prospects of some might be improved. Their new Directors were gentlemen whose names stood high in the Gas Industry, and they were men who had behind them the reputation of being good, fair employers.

"Now," concluded Mr. Livesey, "I must offer to you my sincere thanks for the very handsome gift you have made to me on my resignation. I am very grateful to you for this kind act which renders my retirement so much more happy—as it shows that I leave behind me a spirit of friendliness and wellwishing on your part, as exists, I can assure you, on my part also. My wife and I will always value these handsome dishes as a farewell token of your goodwill."

On the occasion referred to above, when Mr. Frank Livesey, M.Inst.C.E., Engineer and Manager of the Maidstone Gas Company gave a dinner to the staff on his retirement, presentations were also made to two other employees who were relinquishing their positions after many years of service with the Company.

Mr. Livesey himself made the presentation of an all-mains wireless set to Mr. CHARLES SAYER, who has been in the employ of the Company for more than 52 years, 33 of which as General Works Foreman. Mr. Livesey paid high tribute to Mr. Sayer's work, and esteemed it a pleasure and privilege to have been associated with him in daily work for the past twenty-five years, referring also to the affection which was felt for him by the workmen and the appreciation of the Directors for all the care he had exercised during more than half-a-century with the Company. Mr. Sayer, in reply, thanked all his fellow workmen for their kindness in making this presentation, which he would always deeply value. His work had always been a pleasure to him, and he wished them all prosperity in the future.

The other presentation, which took the form of a watch, was to Mr. T. BECKETT, who retired after over 28 years' service with the Maidstone Gas Company. Mr. Small made the presentation, at the same time saying how much they had all appreciated Mr. Beckett's many kindnesses and how much they would miss him. Mr. Beckett thanked them very sincerely for the gift, which, he said, he would value for the rest of his life.

* * *

The Gas Industry will have learnt with gratification that, in immediate succession to Lord Luke of Pavenham (Chairman of Bovril, Ltd.), whose predecessor was Sir Hugo Hirst, Bart. (Chairman of the General Electric Company, Ltd.), Sir FRANCIS GOODENOUGH was elected last Thursday to the Presidency of the Incorporated Society of British Advertisers for the ensuing year. This recognition of the Gas Industry as one of the outstanding advertisers in this country—it was the first of the co-operative advertisers—is as timely as it is deserved.

* * *

At the annual meeting of the Hastings and St. Leonards Rotary Club, held at the Queen's Hotel, Hastings, last Friday, Mr. CHARLES F. BOTLEY, M.Inst.C.E., Past-President of the Institution of Gas Engineers, was elected President. Lord EUSTACE PERCY, Past-President of the Society of British Gas Industries, was elected an Hon. Member.

* * *

Mr. W. E. PRICE, Hon. Secretary of the Institution of Gas Engineers, has progressed so well after his operation for appendicitis that he left the Nursing Home yesterday for "Heather Hills," West Chobham, Surrey.

* * *

Mr. JAMES WOODS, of Willesden Green, London, has been appointed Manager of the Bromyard (Worcester) Gas-Works, and will take up his duties in about three weeks' time.

* * *

Mr. FRANK BARRANS, of Bradford, has been appointed Sales Manager to the Darlington Corporation Gas Department in succession to Mr. W. T. Lane, who recently secured a similar appointment under the Torquay and Paignton Gas Company. Mr. Barrans, who will take up his new appointment on Aug. 1, has been with the Bradford Corporation Gas Department for twelve years.

OBITUARY

The death has taken place at Leicester, at the age of ninety-five, of Mr. C. S. ROBINSON, who was Joint Engineer and Manager, with his brother, of the Leicester Gas-Works before they were taken over by the Leicester Corporation fifty-five years ago. Mr. Robinson was born in Birmingham, and after he gave up his connection with the Gas Undertaking he interested himself in local financial affairs, being for eighteen years Chairman of the Board of Directors of the Leicester Savings Bank, and also a Director of Parr's Bank, now incorporated in the Westminster Bank.

* * *

The death is announced of Mr. GEORGE HOSKISON, of Tamworth, aged 87 years, for many years a Director of the Tamworth Gaslight and Coke Company. He was Mayor of the town in 1893.

Field's Analysis, 1932

This annual publication is always awaited with interest. An advance copy of the issue for the year 1932 has just been received, and a perusal of its contents provides the keen student with a definite measure of the trend of events in the Gas Industry.

On the whole, the year 1932 was a somewhat uneventful one so far as the Industry was concerned, and there was nothing of a sufficiently outstanding character to affect the even course of its progress. This being so it is possible to obtain a more or less definite inference from the study of the output figures. During a period of depression such as is now being experienced throughout the country as a whole it might be expected that the sales of gas would be adversely affected in a corresponding manner, and judging by the indications apparent in so many other industries a large falling-off in outputs might reasonably have been expected. It is therefore pleasing to find that this does not appear to have been the case, and the following figures giving the percentages of increase or decrease for the year 1932 over the previous year in the case of each undertaking will be interesting:

—	Increase.	Decrease	—	Increase.	Decrease
Gas Light	..	2·54	Portsmouth	0·24	..
Commercial	..	4·15	Rochester, &c	..	0·21*
South Metropolitan	..	4·56*	Sheffield	2·17	..
Croydon	..	1·36	Dublin	2·60	..
Hornsey	..	4·85	Birmingham	..	3·48
Lea Bridge	0·71	..	Bolton	..	3·03
North Middlesex	1·02	..	Bradford	..	1·89
Southgate	..	1·75	Carlisle	..	1·14
South Suburban	..	0·59	Leeds	..	3·43
Tottenham	0·98	..	Leicester	..	3·77
Wandsworth	0·80	..	Manchester	..	1·72
Watford	7·92*	..	Nottingham	..	6·08
Bath	0·18	..	Oldham	..	2·77
Brighton	..	0·96*	Rochdale	..	0·43
Bristol	..	1·31	Salford	..	4·05
Derby	2·15	..	Widnes	..	2·55
Liverpool	..	1·84	Edinburgh	0·61	..
Newcastle-on-Tyne	..	0·97	Glasgow	..	2·94
Plymouth	0·10	..	Belfast	..	3·67

* Includes gas sold in bulk.

It is difficult, of course, to draw absolute conclusions from a comparison of one year with its predecessor, as there may be particular reasons affecting the year in question, such as the weather conditions, &c. Another table is therefore given showing the differences in output as between the year 1927 and the year 1932 which should give a more or less true indication of the real progress that has been made.

The above figures on the whole show an increase, when adjusted to make them comparable, of over 5%.

The item in the Analysis which is perhaps of the greatest importance, as it combines a measure of the progress made both from the output side of the question and the financial side as well, is the movement upwards or downwards in the capital employed by each undertaking, together with the charge for such capital; and the following figures have been extracted giving again a comparison as between the years 1927 and 1932. In this case it will be seen that the figures relate in a general way to the various groups of undertakings rather than to the undertakings themselves.

—	1927.	1932.	—	1927.	1932.
	Thous. Therms.	Thous. Therms.		Thous. Therms.	Thous. Therms.
Gas Light	231,715	252,640	Portsmouth	11,268	12,186
Commercial	19,833	17,267	Rochester, &c.	4,248	4,722
South Metropolitan	89,928	91,466	Sheffield	24,409	24,686
Croydon	13,300	14,978	Dublin	9,380	11,352
Hornsey	4,142	3,991	Birmingham	62,099	64,464
Lea Bridge	4,535	5,197	Bolton	6,719	5,352
North Middlesex	3,366	4,081	Bradford	9,877	9,497
Southgate	..	2,174	Carlisle	2,346	2,487
South Suburban	18,365	21,951	Leeds	15,405	13,527
Tottenham	15,919	19,030	Leicester	16,637	11,692
Wandsworth	16,783	27,903	Manchester	32,425	31,823
Watford	..	6,362	Nottingham	13,619	13,069
Bath	5,718	6,016	Oldham	7,356	6,954
Brighton	11,255	13,777	Rochdale	..	3,132
Bristol	18,201	18,977	Salford	9,533	8,443
Derby	8,490	8,769	Widnes	2,361	1,749
Liverpool	..	34,648	Edinburgh	15,318	15,994
Newcastle-on-Tyne	21,885	24,982	Glasgow	42,151	39,655
Plymouth	7,790	8,362	Belfast	17,655	18,439

Capital Employed—per Therm Sold.

—	Year 1927.	Year 1932.
	s. d.	s. d.
Suburban Companies	1 11	2 4
Provincial ,,	1 8	1 10
Dublin	2 11	2 8
Provincial Corporations	2 4	2 10
Edinburgh	3 4	3 8
Glasgow	2 5	2 7
Belfast	2 3	2 2

Total Charge for Capital—per Therm Sold.

—	Year 1927.	Year 1932.
	d.	d.
Metropolitan Companies	1·679	1·811
Suburban ,,	1·620	1·795
Provincial ,,	1·432	1·431
Dublin	3·201	2·741
Provincial Corporations	0·734	0·724
Edinburgh	0·798	0·670
Glasgow	0·879	0·559
Belfast	0·840	0·577

The conclusion to be drawn from the above tables is that the capital expenditure has increased in a greater ratio than the output of the gas sold. The greater charge per therm for capital in the case of the Metropolitan and Suburban Companies is, of course, a reflection of this, but may be partly accounted for also by the fact that larger dividends have been paid in some cases.

Analyzing the increases in sales of gas in order to find whether they are due to the growing requirements of the ordinary consumer or the prepayment consumer, or to an increased activity in the direction of public lighting, it is interesting to note that marked progress indeed has been made with regard to the prepayment consumption, and, further, that a very satisfactory increase can be recorded in every case with regard to public lighting.

The following table sets out the various groups of figures:

Gas Sold—Thousand Therms.

—	Metropolitan.	Suburban.	Provincial.	Dublin.	Provincial Corporations.	Edinburgh.	Glasgow.	Belfast.
Ordinary consumers, 1927	200,523	47,042	79,383	4,773	118,380	12,679	29,180	12,385
,, ,, 1932	213,610	66,864	100,470	4,747	104,053	12,460	25,761	11,923
Increase or decrease, %	6·53	42·14	26·56	0·54 dec.	12 10 dec.	1·73 dec.	11·72 dec	3·73 dec.
Prepayment consumers, 1927	134,638	27,418	30,641	4,385	50,852	1,899	10,647	4,334
,, ,, 1932	140,412	35,633	51,421	6,365	55,451	2 744	11,324	5,174
Increase, %	4·29	29·96	67·82	45·15	9·04	44·50	6·36	19·38
Public lighting, 1927	6,314	1,950	3,240	222	9,146	740	2,324	936
,, ,, 1932	7,351	3,171	5.235	239	12,685	790	2,570	1,342
Increase, %	16·42	62·62	61·57	7·66	38·69	6·76	10·59	43·38

The question immediately arises as to whether the satisfactory progress thus recorded is due to the gas sold per consumer, or whether it is due to the added number of consumers, and diving further into the figures given in the Analysis we are able to present the following statement which shows that to a large extent the movements either upwards or downwards are accounted for by the increase or decrease in the number of consumers. To amplify this statement, the annual consumption per consumer is also shown.

Coal—per Therm Sold.

—	1928.	1929.	1930.	1931.	1932.
	d.	d.	d.	d.	d.
Metropolitan	3·333	3·266	3·324	3·290	3·195
Suburban	4·420	4·262	4·288	4·226	4·122
Provincial Companies	3·508	3·173	3·072	3·204	2·990
Dublin	4·499	4·156	3·938	3·900	3·870
Provincial Corporations	3·677	3·366	3·322	3·310	3·279
Scottish Corporations	3·203	3·210	3·097	3·149	3·185

Annual Consumption per Consumer—Therms.

—	Metropolitan.	Suburban.	Provincial.	Dublin.	Provincial Corporations.	Edinburgh.	Glasgow.	Belfast.
Ordinary, 1927	298	223	224	259	209	137	149	217
,, 1932	268	198	219	253	184	135	133	206
Decrease, %	10·07	11·21	2·23	2·32	11·96	1·46	10·74	5·07
Prepayment, 1927	126	124	108	80	110	87	97	120
,, 1932	113	114	100	81	90	94	89	110
Increase or decrease, %	10·32 dec.	8·06 dec.	7·41 dec.	1·25 inc.	18 18 dec.	8·05 inc.	8·25 dec.	8 33 dec.
Public lamp, 1927	87	77	61	49	75	27	83	84
,, 1932	100	91	63	61	95	26	103	94
Increase or decrease, %	14·94	18·18	3·28	24·49	26·67	3·70 dec.	24·10	11·90

The decreases shown above bear out the contention that to a certain extent the general depression in the country is having its effect upon the consumption of gas. Undoubtedly the widespread unemployment and the effect of the high taxation on the incomes of the people who are still finding it possible to earn a living are factors which find their reflection in a reduction of the money available for the comforts of one sort and another which can be obtained from the use of gas.

The figures quoted with regard to public lighting indicate very clearly that this is a field which must not be neglected, as it will be seen that to-day the sales per lamp very nearly approximate to the average sale to a prepayment consumer. In two cases the consumption actually exceeds the quantity taken by this consumer. This is a very important fact; and bearing in mind the excellence of the public lighting load in most ordinary circumstances no effort should be spared to obtain this business wherever possible.

From this very interesting Publication one could go on abstracting figures until the pages of the " JOURNAL " were filled, and it is difficult in such a case to know exactly where to stop.

It is felt, however, that some reference must be made to the number of appliances on hire, as here again the figures indicate where the various undertakings have found it advisable, and possibly necessary, to increase their activities. The table given below dealing with the various groups shows that during the year 1932, as compared with 1931, there has been an increase in activity in every case with the exception of Glasgow. It should be mentioned, of course, that this statement refers to appliances on hire, whereas we are not furnished with the figures showing the appliances that have actually been sold outright or on hire purchase.

Residuals—per Therm Sold.

—	1928.	1929.	1930.	1931.	1932.
	d.	d.	d.	d.	d.
Metropolitan	2·156	1·976	1·949	1·835	1·827
Suburban	2·235	1·963	2·071	1·945	1·941
Provincial Companies	1·930	1 543	1·354	1·288	1·221
Dublin	3·281	2·708	2·672	2·509	2·601
Provincial Corporations	2·274	1·744	1·735	1 672	1 537
Scottish Corporations	2·015	1·529	1·391	1·251	1·221

Net Cost of Coal—per Therm Sold.

—	1928.	1929	1930	1931.	1932.
	d.	d.	d.	d.	d.
Metropolitan	1·177	1·290	1·375	1·455	1·368
Suburban	2·185	2·299	2·217	2·281	2·181
Provincial Companies	1·578	1·630	1·718	1·916	1·769
Dublin	1·218	1·448	1·266	1·391	1·269
Provincial Corporations	1·403	1·622	1·587	1·638	1·742
Scottish Corporations	1·188	1·681	1·706	1 898	1·964

The figures, it will be seen, show that, although the cost of coal generally has fallen slightly during the five years, the gain has been lost through the fall in the value of the residuals sold, resulting in most cases in an increased cost of " Net Coal."

Finally, it is noted from the Analysis that certain amalgamations took place in 1932. Southend and Brentwood were absorbed by the Gas Light and Coke Company; Hertford, Hoddesdon, and Ware were taken over by Tottenham; and Sheffield acquired the Elsecar area.

The foregoing interesting information gives merely an insight into the mass of detail which can be obtained from the well-known Red Book, and it only remains for everyone who is anxious to keep his knowledge of the vital points of the Industry well up-to-date to obtain a copy of the work and to refer to it as often as possible.

It is unnecessary to repeat that Field's Analysis is accepted as a standard work in connection with the accounts and operations of all the largest undertakings in the British Isles.

The task of compiling the work is in the hands of Mr. H. E. Ibbs, the Chief Accountant of the Gas Light and Coke Company.

The price of the Analysis is 2 guineas, and it may be obtained from the publishers, Messrs. Eden Fisher & Co., 6, 7, and 8, Clements Lane, E.C. 4.

Number of Appliances on Hire.

—	Metropolitan.	Suburban.	Provincial.	Dublin.	Provincial Corporations.	Edinburgh.	Glasgow.	Belfast.
1931	1,958,029	480,384	738,340	79,945	864,820	68,160	250,330	88,289
1932	2,012,886	495,078	754,037	81,679	866,222	70,469	244,579	90,240
Increase or decrease, %	2·80	3·06	2·13	2·17	0·16	3·39	2·30 dec.	2·21

It may also be mentioned that the practice of selling appliances on hire purchase is being fostered by many undertakings rather than letting on hire, and in this may lie the reason for the differences in percentage that are shown as between one undertaking or one group and another.

So far this review has dealt with the distribution or selling side of our business, and before concluding it is necessary that some attention to the manufacturing side should be given. The following three statements are therefore included dealing with the Cost of Coal, the Return for Residuals, and the resulting Net Cost of Coal for each Year from 1928 to 1932:

THE NEWS OF THE WEEK

The Berwick and Tweedmouth Gaslight Company have intimated to their consumers that the price of gas has been reduced to 4s. 6d. per 1000 c.ft.

An All-Gas House exhibited by the Gas Department of the Wombwell Urban District Council, in conjunction with the builder and a firm of house furnishers, is proving a great attraction.

A Series of Cookery Demonstrations and an exhibition of modern gas appliances were held last week in the Showrooms of the Newmarket Gas Company. A cake-baking competition proved most popular.

A Reduction in the Price of Gas has been approved by the Sowerby Bridge Urban District Council of 3d. per 1000 c.ft. The figure is now 2s. 3d. per 1000 (6d. per therm) within the Council's district, and 2s. 9d. in the outer area.

An Additional Farthing Rate, it is stated, will be the outcome of the Okehampton Town Council's decision to accept the tender of the electricity undertaking for street lighting purposes in place of gas which has lighted the town in the past.

The Price of Gas at Grangemouth has been reduced by the Town Council by 5d. per 1000 c.ft. Bailie Drysdale informed the Town Council that the past year had been a remarkably successful one for the Gas Undertakings, which he felt justified the reduction of the price of gas to 3s. 9d. per 1000 c.ft.

The Harrogate Gas Company have secured the contract for public lighting at East Tadcaster in competition with the local Electric Supply Company, who have held the contract for many years previously. The new scheme provides for two, three, and four light cluster burners graded according to the importance of the thoroughfares, and every lamp will be under automatic control and fitted with directional reflectors.

Cheltenham Extensions.—At a meeting of the Evesham Rural District Council last week a letter was read from the Cheltenham Gas Company asking for permission to extend their mains to any village in the Evesham Rural area which might require gas in the future. After some discussion Mr. R. Aldington said that if there were any signs of the Evesham Borough Gas Department extending their own mains into the villages he would oppose the Cheltenham Company's application, but as there were no signs he was in favour of it and proposed that permission be given, and this was carried.

A Report of the Conference held between representatives of Tillicoultry and Alloa Town Councils regarding the proposed acquisition of Tillicoultry gas undertaking by the Alloa Council has been submitted to the Alloa Town Council. At the conference the Provost of Alloa intimated that his Council proposed taking over the Tillicoultry undertaking and asked that Tillicoultry Town Council support the project. Mr. J. W. Napier, Engineer and Manager at Alloa, said that as the Alloa undertaking had no capital charges, they could make gas cheaper than Tillicoultry. The price in Alloa was 3s. per 1000 c.ft., and 5s. in Tillicoultry. At the monthly meeting of the Tillicoultry Town Council the proposal was agreed to.

Smith Meters, Ltd.—On Saturday, June 24, the staff and employees of Smith Meters, Ltd., Athletic Club spent a happy day at Cliftonville. A special train conveyed the staff of men and ladies non-stop to Margate, where an excellent luncheon was provided at the Queen's Highcliffe Hotel. Mr. Ernest Smith, Chairman of the Company, presided, and was supported by Mr. S. E. Cash (Chairman of United Gas Industries and other gas interests), Mr. Lewis Smith (Secretary, Smith Meters, Ltd.), and by the managers of the various departments of the Kennington and Mitcham Works. In a well-chosen speech welcoming the members, and especially the ladies who were present for the first time—this is a fresh milestone in the history of the Company—the Chairman emphasized the fact that each year the numbers increased. After lunch the company dispersed to enjoy the amenities of Margate.

Approval Has Been Given by the Birkenhead Council of the proposal of the Gas Committee to apply for sanction to the borrowing of £55,000 for the supply and erection of continuous vertical retorts of 3 million c.ft. of gas per 24 hours' capacity. The loan will be re-paid in twenty years at an annual capital charge of £4145. The Council has considered it unwise to embark upon renewals of the horizontal retorts which the new verticals are intended to replace.

As a Result of Recent Complaints as to wasteful competition between the Corporation gas and electricity undertakings of the Walsall Corporation, it has been decided that the managers of the two concerns are to meet monthly, or oftener if required, to discuss operations of either department which may be detrimental to the other, and may reasonably be avoided without interfering with the public interests. There is also to be an exchange of information as to applications from consumers and on other points.

Society of British Gas Industries.

A Meeting of the Council was held at 56, Victoria Street, S.W. 1, on June 15—Mr. H. E. Bennet (the Chairman) presiding. Those present were: Dr. E. W. Smith (Hon. Treasurer), Col. O. B. F. Planck, Messrs. A. Comley, H. A. Hobson, John Orme, C. S. Bennett, W. J. Gardner, Albert J. West, Geo. Clark, H. M. Thornton, D. W. Turner (Vice-Chairman), D. M. Henshaw, B. B. Waller, T. F. C. Potterton, W. H. Handley, E. J. Davison, L. Hartley, F. B. Richards, F. J. Gould (Hon. Secretary), and Arthur L. Griffith (Secretary). Apologies for absence were reported from: Messrs. E. J. Fox, Frank West, and Ernest West.

The Chairman referred to the death of the following members:

> Harry J. Donkin, a Director of the Bryan Donkin Company, Ltd., and a respected member of the Council for some years.
>
> Thomas Sanderson, a Director of Sidney Flavel & Co., Ltd., who had been associated with that firm for 65 years.

The members rose in their places as a mark of sympathy.

Messrs. N. Hingley & Sons, Ltd., Dudley, were unanimously elected members of the Society under Section 8.

The amended constitution of the Central Gas Advisory Board was approved.

The representatives on the various Committees for the ensuing twelve months were appointed.

Municipal Transport Authorities and Coal-Gas Driven 'Buses.

The handicap likely to be placed upon the development of the use of coal gas for motor omnibuses by the new tax scheme was briefly discussed at the Annual Conference of the Municipal Tramways and Transport Association which was held in Blackpool from June 21 to 23; and a resolution was passed concerning it.

Alderman P. M. Robinson (Chairman, Chesterfield Corporation Transport Committee) moved the following resolution:

> "That we respectfully urge on the Government the importance of postponing the operation of the proposed increase in the Excise tax on gas driven vehicles for a period of three years in order to give this home produced fuel every opportunity of rapid development."

In moving the resolution, Alderman Robinson said that the present satisfactory position of the Diesel engine would never have been attained had heavy oil been taxed at the very commencement of the development of the Diesel engine. That, however, was to be the position of the Gas Industry to-day so far as the use of gas for motor omnibuses

THE NEWS—*continued.*

was concerned. A number of towns, including Birmingham and Chesterfield, were carrying out valuable experimental work with gas as an alternative fuel for 'buses, and it was felt that to put a tax straight away on gas driven vehicles before this experimental work had been even applied would impose a severe handicap. He understood that the Government had already shown signs of giving way, and were thinking of taking off the tax so far as these vehicles were concerned. He hoped that if the resolution was passed it would be the last straw which would break this iniquitous proposal.

Mr. A. C. BAKER (General Manager, Birmingham Corporation Transport), seconding the proposal, said it was vitally important to do everything possible to encourage the development of the use of a home produced fuel.

Alderman J. A. MOSELEY (Chairman, Coventry Corporation Transport Committee) said that at Coventry a tremendous interest was being taken in the experiments which were being carried out with coal gas as a fuel for motor omnibuses, and the vehicle which had been developed in Birmingham had been tried out in Coventry, with the result that it was believed there was a great future for gas fuel on motor 'buses. Therefore, he regarded it as a great injustice if the Government made any move in the direction of higher taxation for a period of years, at any rate until the experiments were completed.

The resolution was carried unanimously.

[This matter is referred to in our Parliamentary Intelligence to-day.—ED. "G.J."]

New Charges at Huddersfield.

After the first reading of meters following July 1, all gas consumed in the Borough of Huddersfield will be charged at the following rates, all the gas to be consumed in one set of premises. The existing additional charges for gas consumed outside the Borough will be operative on this scale.

Ordinary Meter Consumers, per Quarter.

	s.	d.	
First 1000 c.ft.	4	0	per 1000 c.ft.
Next 2000 ,,	3	6	,, ,,
Next 2000 ,,	2	8	,, ,,
Over 5000 ,,	2	0	,, ,,

Prepayment Meter Consumers, per Collection.

	s.	d.	
First 2000 c.ft.	4	0	per 1000 c.ft.
Next 2000 ,,	3	6	,, ,,
Over 4000 ,,	2	4	,, ,,

Discount—

On first 8s.	½d. per shilling	Slot mechanism set to give 20 c.ft. for a penny.
On next 7s.	2d. ,,	
Remainder of cash	5½d. ,,	

Industrial Consumers, Quarterly Charges.

Below 100,000 c.ft., 20% of consumption at 3s. 5d. per 1000 c.ft., with a minimum of 10,000 c.ft. at 3s. 5d. and the remainder at 2s. per 1000 c.ft.

100,000 to 250,000 c.ft., 20% of consumption at 3s. 5d. per 1000 c.ft., remainder at 1s. 10d. per 1000 c.ft.

250,000 to 500,000 c.ft., 50,000 c.ft. at 3s. 5d. per 1000 c.ft., remainder at 1s. 8d. per 1000 c.ft.

500,000 c.ft. and over, 50,000 c.ft. at 3s. 5d. per 1000 c.ft., remainder at 1s. 7d. per 1000 c.ft.

All accounts are subject to 5% discount monthly settlement.

Gas at the Hertfordshire County Show.

In July last year a Gas Exhibit was organized by certain gas undertakings in the Hertfordshire area (including Tottenham and District Gas Company which, as our readers are aware, now controls Hertford, Hoddesdon, and Ware) this being staged at Hatfield Park on the occasion of the annual County Show.

Considerable interest was displayed by the visitors, and the special committee then formed continued to function and on the occasion of the 1933 show which was held on Thursday, June 15, in beautiful weather, the Committee representing Barnet, Berkhampstead, Harpenden, Hitchin, Letchworth, Tottenham, Stevenage, and Watford, arranged an excellent exhibit which reflects great credit on all concerned.

The Gas Exhibit at the Hertfordshire County Show at Hatfield.

The stand, constructed by Standcraft, Ltd., London, extended over an area of 40 ft. by 12 ft., and was divided into three sections representing bathroom, kitchen, and an area devoted to fittings and appliances. The various companies concerned loaned a number of appliances, and consequently the exhibition was of a very comprehensive nature, including the latest cookers, gas and coke fires, together with a number of types of both instantaneous and storage water heaters ("Ascot," "Vivo," "Sunhot," and sink heaters), coke boiler, gas iron, washing machine, gas-operated refrigerator, radiators, pendant and standard lighting fittings, and a display of sulphate and household ammonia.

Continuous cookery demonstrations were carried on throughout the day which attracted a great deal of interest; these were conducted by Miss S. J. Howe, First-Class Certificate, N.P.I., of the Tottenham and District Gas Company, and her assistant, who were specially loaned for the occasion.

A feature of the stand was the large number of "slogans" exhibited, and the accompanying photograph will give some idea of the display which was awarded a second prize for trade exhibits.

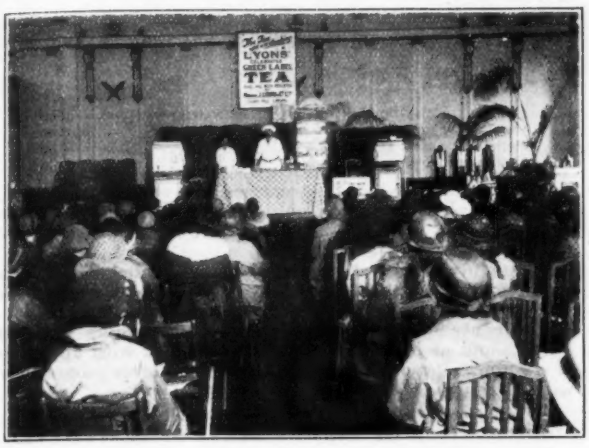
Illustrating the "Vivo" Water Heater

This is one of a new type of van which Messrs. Ewart & Son, Ltd., are now placing on the road. The side of the vehicle, as will be seen, illustrates the functioning of their new "Vivo" water heater, which they say is meeting with great demand, particularly in housing schemes and flats

Gas Cookery Exhibition at Swansea.

The Swansea Gas Light Company recently held a series of Gas Cookery Lectures at the "Capitol," Portland Street, Swansea, conducted by Miss L. Parkyn, Diplomée of the National Training School of Cookery.

The Exhibition was opened by Mrs. Malcolm Smith, wife of the Managing-Editor of the *South Wales Evening Post*, who was supported on the platform by Mr. Ernest Leeder, Chairman of the Gas Company, and Mr. W. H. Johns, Engineer and Manager. Mrs. Smith expressed her pleasure at being asked to open the proceedings, and referred to the support rendered to the Gas Industry by the Stove Manufacturers, who were now able to offer cookers in any colour, to match any colour scheme. She also referred to the posters displayed on the hoardings, which stated "Gas Cooks for the Nation," and said she could well believe this was a fact, when she remembered the millions of homes which relied on gas for cooking.



[*Photo. by Chapman, Swansea.*

One of the Cookery Lectures at Swansea.

Miss Edna Johns then presented Mrs. Smith with a beautiful bouquet of carnations.

Great credit is due to Messrs. Cannon Iron Foundries, Ltd., General Gas Appliances, Ltd., R. & A. Main, Ltd., Parkinson Stove Company, Ltd., the Vulcan Stove Company, Stoves, Ltd., Ewarts, Ltd., and W. H. Dean & Son, for the way in which they co-operated during the Exhibition, and for the tasteful display of self-finished enamelled cookers, geysers, and washing machines supplied for exhibition.

The lectures were well attended; thousands of people visited the "Capitol" and expressed their appreciation of the efforts made to display the latest models of cooking, heating, and water heating appliances for their inspection. Messrs. Dean & Son, of Burnley, held clothes washing demonstrations with boilers and washing machines, before and after lectures, and good business resulted.

The sales of appliances exceeded expectations, and orders are still being received for apparatus displayed at Exhibition.

Accident Prevention.

Experience shows that most of the accidents reported to H.M. Inspectors of Factories are due to preventable causes and that although, in each particular case, the employer and worker concerned are advised by H.M. Inspector as to the measures which should be taken to prevent a recurrence, no completely satisfactory channel has, in the past, been available to the Factory Department by which the circumstances under which these accidents occurred could be brought to the knowledge of the employers and workers generally.

It is obvious that in the interests of industry as a whole it would be a distinct advantage if means were found for disseminating this information as widely as possible. Steps could then be taken to avoid the conditions or circumstances in which particular accidents have been found to occur. With this object in view, the Chief Inspector of Factories has arranged to collect information concerning reported accidents which are likely to be of general interest to employers, workers, and others interested in accident prevention, and to issue short descriptions of these accidents (with illustrations where desirable) in booklet form. This new series of abstracts will be issued quarterly at the low price

of 3d. per issue (postage 1d. extra) or 1s. 4d. post free per annum, and the first number will be published on July 1, 1933. Orders for copies should be placed in advance to avoid delay in delivery.

Holmes' Calendar for 1933.

We have received from Messrs. W. C. Holmes & Co., Ltd., of Huddersfield, No. 3 of their second series of calendar illustrations, all of which are so excellently executed. The present coloured diagram, which is accompanied by three date slips, one for each month of the July-September Quarter, is a reproduction of Plate IV. of "The Process of Manufacturing Coal Gas" (Accum's second book on Gas Manufacture, published in 1819). It illustrates a horizontal retort setting built at the Westminster Chartered Gas-Light Company's Works. The retorts are described as being of circular form, 6½ ft. long, 1 ft. in diameter, the coal being charged to a depth of 4 to 8 in.

Sports at Tunbridge Wells.

The Annual Sports of the Tunbridge Wells Gas Company's Athletic Club were held on Saturday last at the Yew Tree Road Playing Fields, Southborough, and a large crowd were present to witness some excellent racing.

Much amusement was caused in one or two novelty events, which were run in addition to the usual races. In one event the competitors were given a bag of iron pipe and fittings, and after racing with these articles, had to set to, in workmanlike fashion, to make up the word "Gas."

Points were awarded during the afternoon for a Challenge Cup given by the Directors, and this was won by a Prepayment Meter Collector, L. Elson.

Increased Duties Under Consideration.

The Import Duties Advisory Committee give notice that they have under consideration an application for an increase in the import duty on wrought cased tubes of iron or steel; plates, sheets, strip, wire, rods, sections and tubes of brass and alloys of copper, other than nickel alloys; plates, sheets, strip, rods (other than wire rods), sections, wire and tubes (but not including tube shells) of copper; plates, sheets and wrought forms of nickel; ingots, billets, and wrought forms of nickel alloys, other than those containing 60% or more of nickel; rolled sheets, prepared for use in printing and engraving, strip and wire of zinc.

Any representations which interested parties may desire to make in regard to this application should be addressed in writing to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, S.W. 1, not later than July 17, 1933.

Swindon Gas Company's Carnival Exhibit.

For two years in succession the Swindon United Gas Company have taken first prize in their class with their exhibits in the competition organized in connection with the local hospital carnival. The accompanying photograph shows the ingenious display entered by the Company in the form of a decorated motor lorry.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

CONVERSION OF BITUMINOUS COALS INTO PSEUDO-BITUMEN.

Fischer and his collaborators had shown in 1932 that the ease with which solvents act on coal depends on the state of sub-division of the coal. With coal pulverized in the conventional manner (say, through 30 mesh I.M.M.), the bitumen can only be removed by repeated extraction of the coal with benzole at a temperature of 285° C. and under the corresponding pressure. If the coal is reduced to the state of μ-coal (particle size not exceeding μ, or 0·001 mm.), complete extraction is readily secured at 80° C. with benzole at atmospheric pressure. They had also, some years earlier, shown that coal bitumen, extracted by means of benzole under pressure, may be resolved into a solid bitumen insoluble in petroleum ether and an oily bitumen soluble in petroleum ether.

Further work on μ-coal is presented by F. Fischer, K. Peters, and W. Cremer, in *Brennstoff-Chemie*, 1933, 14, 181-184 (May 15). The attempt was first made to secure a better separation of the two types of bitumen (1) by extracting the oily bitumen from the total bitumen with petroleum ether, and (2) by first extracting the oily bitumen from μ-coal by means of petroleum ether. A smooth separation could not be effected by these means, but it was found that if the benzole extract is evaporated on the water bath and under diminished pressure with kieselguhr in the ratio kieselguhr : bitumen = 1 : 1, the resulting mixture of kieselguhr and bitumen is in a form readily permitting successive extraction with different solvents. Various bitumen fractions can thus be obtained. From the kieselguhr-bitumen mixture a relatively large percentage (*e.g.*, 21%) of the bitumen may be removed without decomposition by distillation at 220° C. under a high vacuum, some of the distillate being in crystalline form. Though these products must be present as such in the original coal, they cannot be isolated by distillation of the coal itself. They must therefore be present in coal in a highly adsorbed condition.

Hydrogenation experiments were carried out on μ-coal suspended in benzole both alone and in presence of a molybdenum oxide catalyst. It was found that μ-coal hydrogenates readily at much lower temperatures than are required with coarser coal. The hydrogenation may be effected at pressures below 200 atmospheres and at temperatures between 200° and 285° C.—*i.e.*, at temperatures below which any thermal decomposition of the coal occurs. If the coal has previously been freed from its bitumens by solvent action, further quantities of bitumen (pseudo-bitumen) are formed as a result of hydrogenation and in much larger amount than that of the original bitumen. The yield of pseudo-bitumen increases (1) with increase in the hydrogen pressure, (2) with increase in the reaction time, and (3) with increase in the ratio of benzole to coal. The speed of reaction increases with the temperature. Yields of pseudo-bitumen amounting to 90% of the weight of the coal may be obtained.

Pseudo-bitumens resemble in their properties the true bitumens present in coal, and are thus able to confer coking and swelling properties on a coal which has been deprived of its natural bitumens.

A subsequent paper by the same authors in the same journal (pp. 184-187) deals with the oxidation of μ-coal by means of air at successively increasing temperatures.

TENTATIVE GERMAN STANDARD SPECIFICATIONS FOR COKE-OVEN JOINTING CEMENTS

Faberg-Mitteilungen, 1933, 5, 19 (June 10)—a supplement to *Glückauf* of the same date—gives a table showing the new tentative German standard specifications (Number Berg 3211) for jointing cements for coke ovens. The specifications, which are open to objections until Aug. 10, 1933, are of interest in view of the fact that there are no official standards for jointing cements in Great Britain.

Separate proposals are given for jointing cements for use with lime-bonded silica bricks, clay-bonded silica bricks, semi-silica bricks, and fire-bricks. Except in the case of the firebrick cement, lower limits are fixed for the silica content and upper limits for the alumina content. These are as follows: Cement for clay-bonded silica bricks 88 and 8%; cement for lime-bonded silica bricks 90 and 3·5%; cement for semi-silica bricks 86 and 12% respectively. In this connection it is to be noted that the standard German specification for lime-bonded silica bricks permits a lime content up to 3·5%.

Silica cements must have a refractoriness at least equal to Cone 30, while, in the case of the other cements, the refractoriness must not be more than two cones lower than that of the bricks with which they are to be used.

The after-contraction or after-expansion of all the cements is limited to plus or minus 1% [4 hours at 1400° C.]. When the cements are tested as joints for 4 hours at 1450° C. (silica cements) or 1350° C. (semi-silica and fire-brick cements), there must be absence of fusion, fissuring, and swelling.

The temperatures of initial and complete failure under a load of 14·2 lbs./sq.in. must not be less than are indicated below.

	Initial. °C.		Complete. °C.
Cement for clay-bonded silica bricks . .	1400	..	1600
Cement for lime-bonded silica bricks . .	1500	..	1600
Cement for semi-silica bricks	1350	..	1450
Cement for firebricks	1300	..	1450

A further under-load test carried out on a joint (0·4 in. thick) between two silica cylinders (0·8 in. thick) is also specified, and the limits of failure are the same as in the test on the cement itself.

In an elutriation test, cement for clay-bonded silica bricks must not show more than 20% of clay, and cement for semi-silica bricks must show not more than 30% of clay. The cements must completely pass a sieve with apertures of 1 mm., and at least 80% must pass a sieve with apertures of 0·5 mm. Patching cements must completely pass a sieve with apertures of 0·5 mm.

DEHYDRATION OF TARS BY MEANS OF CENTRIFUGES.

The tar centrifuge made by Maison Hignette, 7 and 9 Rue Robert-Lindet, Paris, and in use for some years past in several gas-works in France and Germany is described in *Journal des Usines à Gaz*, 1933, 57, 241-2 (June 5).

The machine has a large bowl of diameter 27½ in., and runs at a speed of 2700 r.p.m. Its useful capacity for the retention of sludge is 9 gallons. Near the top of the bowl is situated a flat horizontal ring forming a diaphragm enabling separate withdrawal of the tar and liquor to be effected. Wet tar is delivered by way of a pipe extending nearly to the bottom of the bowl. Rotation of the machine causes the tar to be thrown towards the wall of the bowl, the liquor forming an annulus nearer the axis. Sludge is precipitated on to the wall. The tar tends to climb above the diaphragm, and, in virtue of its velocity, passes into a curved adjustable ejector tube. The liquor remains below the diaphragm, and is removed by means of a fixed curved tube.

The tar should be warmed to 105-125° F. The throughput depends on the nature of the tar, on its temperature, and on the degree of dehydration desired. In a particular example, with throughputs of 270, 160, and 70 gallons per hour, the liquor contents of the outgoing tars were 0·6, 0·5, and 0·4% respectively, the temperature being 122° F. In another installation with a throughput of 180 gallons/hour, the liquor content was reduced to 0·7%.

The machine is also employed for the partial dehydration of the tar in circulation as a sealing medium in M.A.N. waterless holders.

A NEW MATERIAL FOR THE PREVENTION OF NAPHTHALENE DEPOSITS IN MAINS.

W. v. Piotrowski and J. Winkler, in *Brennstoff-Chemie*, 1933, 14, 208-9 (June 1), describe their search for a spraying liquid which is cheap, insoluble in water, similar in vapour pressure to tetralin, but a better solvent for naphthalene than is tetralin. They found that oxidized dehydrogenated petroleum products fulfil these conditions and they have applied for patents for the use of such materials for the prevention of naphthalene deposits.

Petroleum fractions are treated with air at a suitable temperature and pressure, with or without a catalyst. Treatment may be in the liquid phase (Penniman's patents) or in the vapour phase with catalysts as patented by the authors. Large scale production has been proceeding in the petroleum refinery of the Galicja A.G. at Drohobycz for 1½ years.

The warmed petroleum fraction is sprayed into a reaction chamber by means of a stream of air heated to

XUM

300° C. The amount of air used depends on the nature of the petroleum fraction and, with a distillate boiling between 80 and 220° C., may be about 0·025-0·033 c.ft. (30 in., 60° F., satd.) per pound of material treated. The reaction product leaves counter-current to the incoming mixture. The reaction temperature is 260-300° C. The catalyst consists of porous balls of porcelain impregnated with ammonium molybdate and activated with copper phenolate. The outgoing products are fractionated by means of a column. A gas having a calorific value of about 315 B.Th.U. is obtained as a bye-product and may be used either for heating the reaction vessel (which also requires local cooling to dissipate the heat of the exothermic reaction), or as a means for odorizing town gas. The liquid product (marketed as Denoxol Solve) has, at a given boiling point, a specific gravity approximately 0·1 higher than that of the raw material. It consists of aromatic hydrocarbons of high boiling point (20-40%), higher alcohols (10-30%), and higher unsaturated and aromatic aldehydes and ketones (30-40%).

Manchester Association at Nottingham

A Hearty Welcome

A "bull's eye" was registered at Nottingham last Friday, when the Manchester District Association of Gas Engineers paid a visit, as is the custom, to the town of their President, on the cordial invitation of the Chairman and members of the City of Nottingham Gas Department. Though in one way customary, the visit was in another way unusual, inasmuch as the President, Mr. George Dixon, B.Eng., late of Lancaster, has now moved into the Midlands area. Mr. Dixon had, however, received high honour at the hands of his colleagues in the North, and it was most gratifying to him that the City of Nottingham should so wholeheartedly join in doing honour to his fellow members of the Manchester Association.

During the morning, some sixty members arrived in Nottingham, with the indefatigable Hon. Secretary (Mr. J. Bridge, of Elland). Among the visitors present was Mr. Frank P. Tarratt, the newly-elected President of the Institution of Gas Engineers. The party were conveyed to the Basford Gas-Works of the Nottingham Corporation, the largest of the three manufacturing stations of the undertaking. These works were inspected on the occasion of the visit of the Institution of Gas Engineers to Nottingham in 1927, and a description of them was given in the "JOURNAL" dated June 29 of that year. At that time, it will be remembered the President of the Institution was Mr. John Wilkinson, then Nottingham's Gas Engineer and Manager, and it was a great pleasure last Friday to find Mr. Wilkinson present at Basford among those who were assembled to welcome the visitors.

After some time had been spent on the works, a return was made to the centre of the city, and a party of about seventy-five, including leading Nottingham public officials, sat down to luncheon in the handsome Council House, as the guests of the Corporation. It was a genial function, thoroughly enjoyed by all who were privileged to be present, though there was general regret at the absence of the Lord Mayor, who was on holiday, of the Sheriff (Councillor W. W. Weldon), who was consequently unusually busy, and of Sir Albert Ball (the Chairman of the Gas Committee), who was on his honeymoon. The visitors, however, received a most cordial welcome, on behalf of the Corporation, from Councillor C. G. Barnes (Vice-Chairman of the Gas Committee), who was supported by the Under-Sheriff (Councillor A. S. Bright), and from Councillor E. G. Underwood (a member of the Gas Committee).

Appreciation of the Council House was voiced by Mr. F. P. Tarratt, who made his first speech on behalf of the Institution of Gas Engineers since his recent election as President of that organization. He said he did not think he had ever been in a more charming building. The Nottingham Gas Undertaking, he went on to point out, has been prominent for many years, and has been managed by a succession of excellent engineers. They had had ample evidence that morning, during their inspection of the largest manufacturing station of the Corporation, of the good work that had been done by Mr. Wilkinson during the time he was Engineer at Nottingham. "Mr. Wilkinson's colleagues," said Mr. Tarratt, "have always had the greatest admiration for him—in fact, he has been known to them by the name of 'Honest John.'" [Applause.] He (Mr. Tarratt) was quite confident that under the new Engineer, Mr. Dixon, the undertaking will continue to make progress. They were meeting outside the Manchester area that day to honour Mr. Dixon as President of the Association, and it was a great compliment to Mr. Dixon that they were being so generously entertained.

The reply to the toast of "The City of Nottingham and the Chairman and Members of the Gas Committee," which Mr. Tarratt submitted, was made by Councillor C. G. Barnes, who was in the chair. It was pointed out by the Councillor that Nottingham has always been progressive, and that during the last few years there have been an exceptionally large number of improvements. He felt sure the visitors would leave Nottingham convinced that they had seen one of the best organized gas undertakings in the country. ["Hear, hear."] In these circumstances, it was a pleasure, though not a surprise, to learn that, in spite of strong opposition by the Electricity Department, the Gas Department is holding its own. Councillor Barnes said he would have liked Sir Albert Ball to be present to reply to the toast, because he is such an enthusiast for gas, and is a great champion of the Nottingham gas undertaking.

On behalf of the Gas Committee, of which he declared himself proud to be a member, Councillor E. G. Underwood heartily welcomed the members of the Association to Nottingham, which the previous speaker had stated justly claims to be the Queen of the Midlands. "We had in Nottingham," said Councillor Underwood, "the benefit of the guidance and help for many years of one of the most capable managers who ever occupied such a position. I know you admire him as much as I do. In our own hearts those who have been associated with him have the same feeling of respect for him now that we had in the past. Mr. Dixon is a very worthy successor to Mr. Wilkinson. I do not believe we could have found a better one. Everything is going wonderfully well, and I thank you gentlemen for sending him here." [Applause.]

The toast which Councillor Underwood had proposed was "The Manchester District Association of Gas Engineers," and the reply was appropriately made by Mr. George Dixon, as President. Mr. Dixon expressed his appreciation of the fact that he has been allowed to occupy the Chair of the Association, although he has left their district. He voiced his pleasure at the presence of several members of the Nottingham Gas Committee and of some of the chief officials of the Corporation. "My time," he said, "is made very pleasant by the co-operation of the officials here. But perhaps even a greater honour than anything else is the presence among us of the President of the Institution of Gas Engineers. That Mr. Tarratt should have come all the way from Newcastle is, I think, a manifestation of sympathy that we appreciate more than we can express. I also greatly appreciate the presence of my predecessor, Mr. Wilkinson. Mr. Wilkinson and his wife have been more than friends to myself and my wife since I came here. Never was I more optimistic about the Gas Industry than I am to-day. I have been astounded at the inquiries we are getting from industrial concerns."

After lunch, some time was spent by the visitors in admiring the Council House, further beauties of which were revealed at every turn. Finally inspection was made of the apparatus for heating the building. This installation, which has been converted to gas from oil, comprises five 12 section "Major" Robin Hood boilers. Each boiler has a heating power of 1,290,200 B.Th.U. per hour, to heat 8960 sq. ft. of radiation. Each of the burners (which have been supplied by British Furnaces, Ltd., Derby Road, Chesterfield) will pass 4260 c.ft. of gas per hour maximum, at 35-tenths water column.

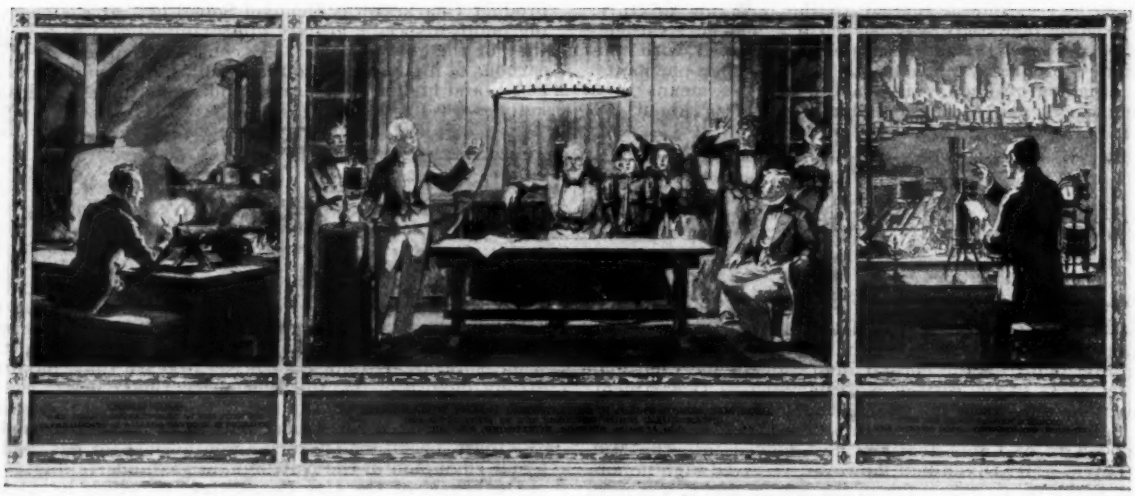
Tests show that, when working at full capacity, the air louvres must be at full open position and the air controlled by waste flue dampers. The advantage of louvres is therefore restricted to conditions which provide for a considerable shut-down period.

From numerous tests made, a CO_2 content of 9% is found to be most satisfactory.

It is desirable to govern the gas pressure in order to ensure uniform combustion.

The afternoon was devoted to a drive to Wollaton Hall, which was reached via the Castle, Trent Embankment, University Boulevard, the University, &c.—the modern factory of Messrs. Boots being taken *en route*. Wollaton Hall, formerly a notable private residence, is beautifully situated, and in the brilliant sunshine looked its best. Tea was served there, after which a return was made to Nottingham.

First Public Use of Gas in America



COMMEMORATING REMBRANDT PEALE'S USE OF GAS FOR LIGHTING IN 1816.
A Painting by R. McGill Mackall.

On April 28 a group of donors presented to the Baltimore Municipal Museum—formerly Peale's Museum—a painting by Mr. R. McGill Mackall commemorating Rembrandt Peale's use of gas for lighting his museum in 1816.

On the occasion, Mr. Charles M. Cohn, Vice-President of the Consolidated Gas, Electric Light, and Power Company of Baltimore, explained to those present that out of the display of gas lighting arranged within the museum by Rembrandt Peale in 1816 Baltimore gained the distinction of being granted the first franchise for the supply of gas in America.

Rembrandt Peale, he continued, was a distinguished member of an illustrious family of artists associated with Maryland and Pennsylvania in the 18th and 19th Centuries. Born in 1778, at the age of 17 he had obtained a sitting from George Washington. In 1801 he came to England, where he pursued his studies. Three years later he was in Philadelphia, and in 1807 he was in Paris, painting portraits there. Later he moved to Baltimore and established a museum and gallery of paintings. His death occurred at Philadelphia in 1860.

In connection with the exhibition of " the ring beset with gems of light " in his museum in 1816 we have Peale's announcement over his name as it appeared in the *American and Commercial Daily Advertiser of Baltimore* on June 13, 1816.

" GAS LIGHTS "

WITHOUT OIL, TALLOW, WICK, OR SMOKE.

It is not necessary to invite attention to the gas lights by which my saloon of paintings is now illuminated; those who have seen the ring beset with gems of light are sufficiently disposed to spread their reputation. The purpose of this notice is merely to say that the Museum will be illuminated every evening until the public curiosity shall be gratified.

REMBRANDT PEALE.

Four days later an ordinance authorizing the Gas Light Company of Baltimore to lay pipes was passed by the Baltimore City Council. The charter of the Company was enacted by the General Assembly of Maryland on Feb. 5, 1817.

ADDRESS

By Mr. ALEXANDER FORWARD.

An Address was given by Mr. Alexander Forward, Managing Director of the American Gas Association, in the course of which he said:

In almost every case the records of well-operated and successful gas companies are inseparably bound up with the development of the communities they serve, and Baltimore is no exception, but rather a shining example. The Consolidated Gas, Electric Light, and Power Company of Baltimore and its antecedents have been in the service of the people of the City since 1816, and its beginning antedated the steam railroad, electricity, the telegraph, and the telephone.

The first trade journal of the American Gas Industry reported in its first number, published on July 1, 1859, that, under the Presidency of Columbus O'Donnell, the Baltimore Company had a total length of mains amounting to 65 miles, 8200 customers, and 1800 public lamps.

For the year ended Dec. 31, 1932, the report of stewardship of the present Company's responsible officers, Messrs. Aldred, Wagner, Cohn, Clarke, and Schmidt, presents an interesting comparison over the intervening 73 years. The miles of main have increased from 65 to 1412 and the gas customers from 8200 to 195,087. For almost a quarter of a century this remarkable quintette of executives has successfully directed the affairs of the oldest company in our country, and by their works they are known.

Toward the close of the eighteenth century numerous developments occurred in many countries and widely separated cities whereby the possibilities of manufactured gas became better known. To-day we probably would classify many as experimental installations; most of them were for individual applications to homes and factories. Winsor in England, Lebon in France, and David Melville in the United States were among the earliest who had a definite hand in promoting the new project. In London, for example, Winsor gave a public display of gas lighting at the Lyceum Theatre in 1804; David Melville, of Newport, Rhode Island, appears to be the first to have manufactured gas for illuminating purposes in America. He lighted his home and the street in front in 1806.

The great lighting experiment in Baltimore was carefully watched by other communities, which eventually followed suit a few years later, Boston and New York being next in order. As an illuminant for street and home lighting gas speedily found itself passing from the novelty and luxury stage to that of a necessity; and so another great public utility service came into being. For many years various forms of open flame burners were employed, functioning on the same general principle of the cockspur discovered by Murdoch. Next came the Argand, a circular burner modelled on the oil Argand. Later, the Industry adopted a revolutionary development in lighting when Bunsen's blue flame burner with Auer's mantle attached became available. About 1890 what was later known as the Welsbach incandescent mantle burner came along at the psychological moment to strengthen the hands of an established lighting industry just beginning to feel the competition of Edison's new electric light. A few years later the inverted shadowless mantle burner was introduced to assist in meeting, for a time, the seemingly irresistible progress of the electric light.

FROM C.P. TO B.TH.U.

There are some who do not concede that gas for lighting has had its day, and in many a large European city modern high-pressure incandescent gas street lighting is a joy to behold and of economic interest to its users. But, however that may be, the use of gas as a heating agent in the bunsen burner to raise to incandescence the rare earths of Auer's mantle gave added impetus to the use of gas as a fuel. The

unit of heat became more important than the measure of light, and candle-power gave way to the B.Th.U. Other applications of the new fuel, in addition to lighting, were speedily made, notably that of cooking. As early as 1849 a Mr. Ricketts registered the Economic gas cooking stove with which, it was claimed, a large family " might provide themselves with fuel for roasting, boiling, stewing, and broiling, at all hours, without the waste of having to maintain a large coal fire constantly burning." The commentator went on to remark " we hope at no distant time to see a gas cooking stove and gas fittings, as landlords' fixtures in the humble dwellings of the working population of our cities and towns, as well as contributing to the comforts of the mansions of the rich."

One earnest inquirer in 1859 sought information concerning the cooking of a whole ox by gas. He was advised that " while it was unusual it was not without precedent, in that a monster joint weighing 535 lbs. was cooked (1850) in England on a dripping pan environed with brick, and surrounded with 216 jets of gas and covered with sheet iron." It took five hours to roast; to cook this piece of beef, he was advised, by an ordinary fire would have taken fourteen hours—" a startling fact for hotel keepers to consider."

Another confidently stated in 1860 that " the time is not far off when we shall use much gas in culinary purposes and the lighter branches of art manufactures."

To-day, gas automatically maintains desired temperature conditions in thousands of homes, and in addition may keep the summer air cooled and in just the right condition of humidity for maximum personal comfort. The latter is another " Baltimore first " activity. In the spring of 1929 there was placed, in another place of public assembly, a theatre in McKeesport, Pennsylvania, a summer air conditioning installation. The equipment was designed and manufactured in Baltimore, and gas is the source of energy which automatically brings coolness and comfort to satisfied audiences.

It will be observed that when gas was first manufactured it was introduced as an illuminant and that next it was found practicable for use as a fuel for cooking, and then came its application to space and central house heating. But there is still another and very important use whereby gas found another logical place—the use of gas in industry as a source of automatically controlled heat, smokeless and requiring no storage.

Frederick Accum printed a letter from R. Ackerman written on March 13, 1815. Mr. Ackerman was a printer, and for four years up to the time of writing had lighted his " public library, warehouses, printing office, and workshops, together with his dwelling house from the kitchen to the drawing-room " by means of an individual gas manufacturing plant, " to the total exclusion of all other lights." He concluded " in addition to which my printers employ 16 cockspur burners for 10 hours per day to heat their plates instead of charcoal fire."

Mr. Accum also reported another individual gas making plant installed at the factory of a Mr. Cook, a metal toy manufacturer at Birmingham, " a clear-headed, prudent man, not apt to be dazzled by fanciful speculation, but governed in his transactions by a simple balance of profit and loss." In addition to saving three shillings a day for candles, which gas entirely superseded, Mr. Cook " now does all his soldering by the gas flame only."

From these small and simple beginnings has grown an enormous Industry serving the peoples of practically all civilized countries. Last year, according to the preliminary estimates, the manufactured gas companies in America alone sold 372,208 million c.ft. of gas for use in the home and industry, with a value of $411,750,000.

The Reasons for Progress.

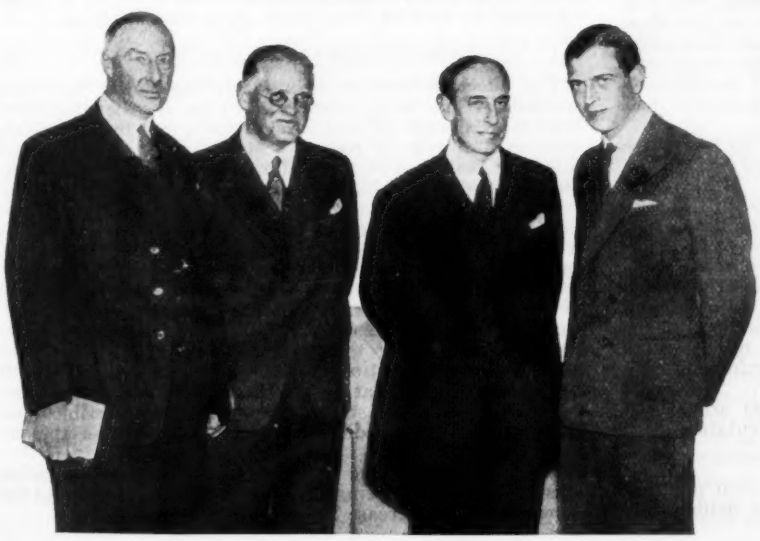
It must not be assumed, however, from the growth indicated by the figures I have quoted, that the Gas Industry arrived at its present position by a fortuitous combination of circumstances. Just as its first uses were in direct competition with established sources of light, heat, and power, so has it continuously had to meet various forms of competition.

Mr. Rudyard Kipling, in his Rectorial address at the University of St. Andrews, announced that nothing ever changes from age to age except the words in which man expresses his thoughts, the appliances he makes and uses, and the rate of speed at which he propels himself and his possessions through space. However this may be, the Gas Industry has seen about as many and complete changes as any industry can experience, and has adapted itself to all of them. In addition to endeavouring to meet the situation euphemistically known as " competition for the customer's dollar " it is faced with the efforts of other fuels in the home and in industry. Numbered within these ranks are both the old and the newer fuels, arrayed in solid but unjoined front. The Gas Industry must perforce meet in strenuous combat the claims of hard and soft coal, largely augmented by automatic equipment, such as producer gas plants for industry, and stokers for the home as well as for the factory. There is also the very aggressive attack of the oil burner, again in the factory and the home, as well as that of other liquids which are readily and simply converted into gases of high heating value. Even our erstwhile competitor, and later sister industry, electricity, is after some of our business. But the Gas Industry, with great unanimity of purpose and singleness of mind, presses forward, secure in the faith that its cause is founded upon the soundest of fundamentals.

Among its handmaidens is that which gave it birth—Research. Research in production processes, in distribution materials and methods, in utilization and in rate making—these and many others, all have played a most important part.

In 1933 the Gas Industry has men like Rembrandt Peale, men who have the curiosity to seek the undiscovered, the ability to look beyond the grooves of daily existence, the will to push further back the frontiers of ignorance and thus shed light on the pathway up which mankind marches eternally to make life better for himself and for those who follow. While the Gas Industry has had a long and interesting past, it has a longer and even more interesting future. It is singularly appropriate that the now historic display made by Rembrandt Peale in 1816 should be suitably commemorated 117 years later in the same room. It is a happy augury for greater things to come.

Exhibition of British Industrial Art



The Exhibition of British Industrial Art in Relation to the Home, which was opened by H.R.H. Prince George at Dorland Hall, Regent Street, W. 1, on June 20, has had the active co-operation of the Government, and is in accordance with the policy recommended in the Board of Trade Report on Art and Industry (1933). It is the first selective exhibition of Industrial Art held in this country. Every object exhibited has either been specially designed, or approved by selection committees as the best designed and made of its kind. Thus the exhibition differs fundamentally from any applied art exhibition hitherto organized in this country on a similar scale. Our photograph shows (from left to right): Lord Gorell (President of the Exhibition), Sir Francis Goodenough, Dr. Burgin (Parliamentary Secretary to Board of Trade), and H.R.H. Prince George, photographed in the gas kitchen at the exhibition.

Midland Coke Research Committee

Report of Progress During 1932

In the Report for 1932 of the Midland Coke Research Committee, which was formed in 1926, it is stated that an experimental coke oven, erected at a coke oven plant, in which it is possible to coke 500 lbs. of coal under conditions almost identical with those of coke oven practice, has been used continuously throughout the year, four tests having been made each week. Five series of tests have been made using poorly coking Yorkshire and Derbyshire coals as the stock slack. When possible, the effect of varying the coking-time, for a fixed oven width (18 in.), has been determined.

It has been confirmed that an 18 in. oven coking in about 18 hours generally gives the optimum quality of coke. With one poorly coking West Yorkshire slack the effect of varying the rate of heating was found to be more pronounced than usual, soft cokes (of about 72 shatter index, 1½ in.) being produced with rates of heating of less than 1 in. of oven width per hour, whereas the hardness was increased to 76-80 by coking with rates of heating of 1 in. per hour or more.

When the most suitable coking time had been determined, the effect of blending the coal with fusain, with finely-ground coke breeze, and with better coking coals, was studied. It has been found that the addition of fusain or finely-ground coke breeze does not invariably improve the hardness of the coke, the first requirement with some coals being the addition of a proportion of a better coking coal but the subsequent addition of fusain or coke dust is always advantageous. It was shown, for example, that by the addition of 30% of a good Yorkshire coking coal and 3% of coke dust, a coke of shatter index 87 (1½ in.) could be made using a Derbyshire coal which by itself could not be used for making a satisfactory coke from a top charge. A similar effect could be produced by adding 30% of a Durham coking coal without coke dust.

In blending a good coking coal with a coal which by itself does not make a commercial coke, it has been found by systematic tests that large quantities of the non-coking coal can be used in the manufacture of cokes of good quality, while the addition to such blends of coking and non-coking coals of fusain or coke dust invariably improves the coke. In this way, the range of coals which may be satisfactorily used for coke making can be greatly extended. It is clear also from this work that the softer cokes of West Yorkshire and Derbyshire could be considerably improved by blending with a good coking coal like the Silkstone seam of South Yorkshire. To raise the average 1½ in. shatter index of cokes from these areas to 85 (from, say, 75 or even less) the admixture of 20 to 40% of a good coking coal with some coke dust or fusain is desirable, the use of fusain or coke dust reducing the amount of "foreign" slack which is needed. A suitable blend should then be top charged and coked in an 18 in. oven in about 18 hours.

Box Tests.

(*a*) *Size of Coke Dust for Blending.*—A series of "box tests" using 150 lbs. of coal in a cage, inserted within a coke oven charge, has shown that coke dust of less than 20 mesh size (less than $\frac{1}{30}$ in.) is as effective in increasing the hardness of coke as dust of less than 200 mesh size. There should preferably be little coke dust of less than 60 mesh size in the 20 mesh dust. The use of this coarser dust reduces the costs of grinding considerably.

(*b*) *Effect of Vitrain on the Coking Properties of Coal.*—Concentrates rich in vitrain have been obtained by treating bright coal in a small-scale Lehmann mill. Mixtures of which the vitrain contents have been increased in this way do not show any marked improvement in coking properties.

(*c*) *Effect of Durain on the Coking Properties of Coal.*—A number of tests have shown that, while durain of the same size as ordinary coking slack, on blending with bright coal, has little or no influence on the hardness of the coke, and durain ground to less than 200 mesh size influences the hardness adversely, durain of less than 10 mesh size in amounts of less than 10% can improve the hardness of coke made from ordinary Parkgate coking slack. The exact conditions for obtaining the possible benefits are as yet obscure and require further tests for their elucidation.

Sampling Coke.

A number of tests were made at a coke oven plant at which the moisture content of the coke was deliberately varied, and 150 samples were taken from each batch to determine the average deviation from the mean moisture content for increments of 5 lbs., 2½ lbs., and 1 lb. It has been shown that the average deviation from the mean increases with increasing mean moisture content to about 10%. From these tests, the weight of gross sample required to obtain an average moisture content correct to plus or minus 1% in 99 out of 100 tests has been calculated by the theory of errors. It has also been shown that the use of small increments, for example, 1 lb., gives an abnormally high average moisture content, increments of at least 2½ lbs. being required to obtain reliable results.

Further tests at plants employing "central quenching" and hand-hose quenching on an inclined bench have shown that the latter method tends to give higher "average deviations" for a given average moisture content than when quenching on a coke car is practised; in other words, the quenching operation is under less control and a larger number of increments is required to obtain a correct average moisture content.

These tests and others reported earlier have formed the basis of the Draft Standard British Specification for the sampling of coke.

Further tests have shown that the "moisture sample" of coke can be used for general analysis (instead of using a separate sample as in the Draft British Standard Specification) if a larger sample than 1 lb. is taken when the coke has been crushed to less than ½ in.

Laboratory Work.

(*a*) *Coking Test.*—The Sheffield Laboratory coking test for determining the swelling power of coals (which is closely related to their value for coke-making) has been used for a further series of coals. The results of these tests show that the hydrogen content of a coal has a greater significance so far as its coking value is concerned than has previously been apparent; for a given carbon content a coal of high hydrogen content is more strongly swelling than one of low hydrogen content.

(*b*) *Plastic Range.*—Further tests on coking coal at constant volume show that the plastic range of a coal is wider under such conditions than when the coal is allowed to expand. The tests have disclosed a new method for determining the plastic range of coal, which is simple to carry out.

(*c*) *The Reactivity of Coal and Coke.*—Further tests on the relationship of the rational analysis of coal in relation to coking value have been mainly concerned with the reactivity of coal and coke. The reactivity test (treatment with alkaline potassium permanganate) has given interesting results for such materials as graphite, wood charcoal, and a number of cokes. The test is being further examined to see if it can be used for disclosing differences in the behaviour of the carbon in different types of coke. A hearth coke made from lump coal, similar to that first used for making iron in blast furnaces in this country, is being examined to see how it compares with wood charcoal.

Deterioration of Coals on Storage.

The effect of storage on the swelling power has been studied. It has been shown, both by small-scale laboratory tests with storage of coal as a powder, and by large-scale tests with storage of coal as "slack," that coal from the Silkstone seam can be stored for a period of one year without deterioration of its coking properties. Actually, an increase in the swelling power of this coal is found during the first four months of storage, and a better coke is made from it in the experimental oven during this period. The laboratory tests showed that only coals of over 85% carbon content (on the dry ash-free basis) did not deteriorate. Coals of lower carbon content decreased in swelling power continuously with increase in storage time, the rate of decrease being greater the lower the carbon content of the coal. The deterioration of some Derbyshire coking coals in practice is such that even a short holiday week-end may cause difficulties. A study is being made of possible "inhibitors" of the oxidation reactions that cause the deterioration.

The effect of the size of coal stored on the deterioration was also studied, it being shown that the larger the coal the slower was the decrease in swelling power.

Inauguration of Skipton's High-Pressure Holder

Many gas engineers foregathered at Skipton on June 20 when a new high-pressure gasholder, the first of its kind in the British Isles, which has been built on plans and specifications prepared by Mr. N. B. Thompson, the Skipton Urban District Council's Gas Engineer and Manager, was formally opened by the Chairman of the Gas Committee, Mr. W. Bellamy.

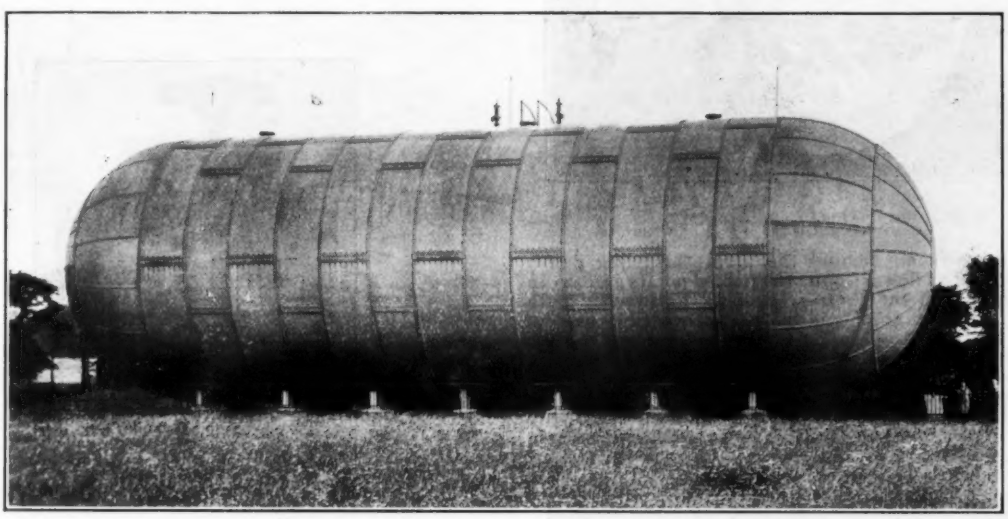
The new holder is a steel cylinder with hemispherical ends. It is 32 ft. in diameter by 102 ft. long, on cradle supports. The joints are riveted and the holder is complete with internal framework, ladders, manholes, safety valves, and lightning conductor. The word " Skipton " is painted in bold letters on the top of the holder, with an arrow pointing North as a guide to aircraft, and it is situated in a good position for this purpose, being south-west of the town and adjacent to suitable landing grounds.

The holder has a net volume of 75,000 c.ft. and an effective capacity of 250,000 c.ft. at 50 lbs. per sq. in. It is situated nearly a mile from the works and the gas is conveyed there through 4 in. steel wrapped mains with welded joints. At the works end is a horizontal steam driven reciprocating gas compressor. The holder is to be used at present for additional gas-works storage, and when the gas is required it is released back into the low-pressure holders at the works end. Later, the holder will be used to give an independent supply to the village of Carleton, which at present is connected to the end of the Skipton town supply equivalent to 45 ordinary Lancashire boilers and the gas pressure inside is about 300 times the normal town low pressure. At the works there is a storage of 464,000 c.ft. Of this, only 304,000 c.ft. is effective, and this is equivalent to 14 hours' supply based on the heaviest day's output. The new holder has a storage of 250,000 c.ft., equal to 10 hours' supply on the same basis; therefore there is a total of 554,000 c.ft., which is equivalent to 24 hours' supply based on the maximum output.

Mr. N. B. Thompson, who gave these interesting details at a luncheon held after the formal opening, paid a tribute to Messrs. Newton, Chambers, & Co., Ltd., for their work during the manufacture and erection of the holder, and, concluding his remarks, expressed personal thanks to the Chairman and members of the Gas Committee of the Skipton Council for the confidence they had reposed in him and their kind co-operation throughout the whole of the scheme.

In the lay-out of the scheme the Gas Engineer has had an eye for beauty, and trees have been planted round the new holder, which within a very short time they will completely screen.

Following the turning on of the valve by the Chairman of the Gas Committee (Mr. W. Bellamy), the company inspected the various features of the new holder; many climbed to the top; and they later visited the gas-works and saw the new compressor.



THE NEW HIGH-PRESSURE HOLDER AT SKIPTON.

at low pressure. In future there is a possibility, with this high pressure, of supplying outlying villages and villages up the Dales, and also there will be gas available at high pressure for industrial purposes.

The special features with regard to the holder are that its total weight of steel work is 250 tons, which is similar to the weight of steel in an ordinary gasholder of the same size. By dispensing with the water tank the foundations have not had to be designed to carry a weight of water which would amount to an additional 3000 tons—a considerable item. The total number of rivets in the structure is 28,000; the load on the ground, including the weight of the foundations, is only 6 cwt. per sq. ft., as compared with the ordinary type, which is 18 cwt. per sq. ft. The external surface area is only 11,000 sq. ft., compared with 28,000 sq. ft. for the ordinary type. The total height is only 34 ft., as against 100 ft. for the ordinary type. The Council have made an immediate saving on capital commitments of £12,623, and a permanent capital saving has been effected of £4171. The cost of the holder is approximately £4400. Although the holder has been constructed nearly a mile from the existing works the whole scheme has only cost £6872, as against £6942 for the original scheme for a holder of the same size of the old type at the works.

Although the ground was bad, piling has been unnecessary in the light foundations, owing to the absence of water tanks. There is less surface area to paint. Painting will not be required as frequently as with the ordinary types owing to the fact that the " wind and water line," due to immersion, is entirely dispensed with.

It is interesting to note that the size of the new holder is

Opening Ceremony.

Performing the opening ceremony, Mr. Bellamy described the occasion as a landmark not only in the history of the Skipton undertaking, but in gas storage in this country. With the flexibility of the system it seemed to him there would be many possibilities of developing the use of gas in the locality. Mr. Bellamy complimented the Council's Engineer on his work and also the Contractors, Messrs. Newton, Chambers, & Co., Ltd., on their excellent workmanship.

A Well-Conceived Undertaking.

Subsequently, a luncheon was held at the Black Horse Hotel, Skipton, and a number of toasts were submitted. That of the Gas Undertaking was honoured on the call of Mr. C. S. Shapley, Engineer and General Manager to the Leeds Gas Department, who complimented Skipton upon being pioneers in the new method of gas storage. He also spoke of the necessity for adopting such scales of charges as would result in increased gas business.

Mr. W. T. Kitching, General Manager of Messrs. Newton, Chambers, & Co., Ltd., replying to the toast " The Contractors," said he hoped to live to see the day when every ounce of coal mined in this country was carbonized. Mr. Kitching complimented Mr. Thompson on the progressive step he had taken. The construction of the holder was work particularly suited to his firm, as they were specialists in this type of bent plain and riveted work.

In conclusion, Mr. Kitching presented Mr. Bellamy, Chairman of the Gas Committee, with a silver bowl from his firm as a memento to " a bold undertaking, well conceived and well completed."

GAS MEASUREMENT PRACTICE IN EUROPE

A Comparison with American Methods

[Contributed.]

Modern conditions have rendered it necessary to find a substitute for the volume meter, and the matter had to be considered from two points of view. The apparatus had to be capable of dealing with large quantities of gas and had to withstand high pressures.

The first means resorted to was the " partial flow " process. It was a half-way measure between volume measurement and differential pressure measurement. A pipe branches off in front of a throttling point in the gas main and leads part of the gas, through a small throttling point,

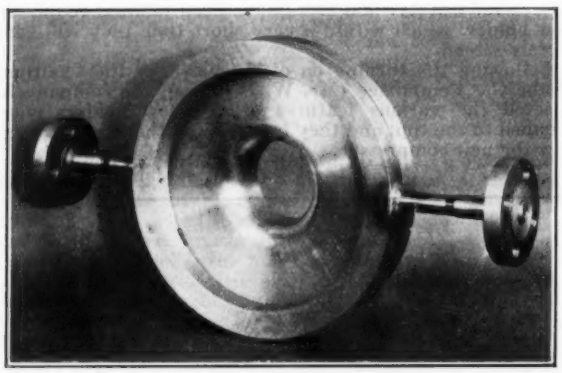


Fig. 1.

back to the gas main behind the main throttling point. The values for the flow at both throttling points remain in the same ratio and the pressure drop is the same in both cases. The small flow of gas in the branch pipe can, of course, be measured in a much smaller volume meter than when the latter is fitted in the main pipe. The difficulty is to ensure the proportionality of the flow of gas in the branch pipe. The so-called " flow balance " is after the manner of a pressure regulator; it adjusts automatically the value of the pressure behind the throttling point in the branch pipe to the value behind the throttling point

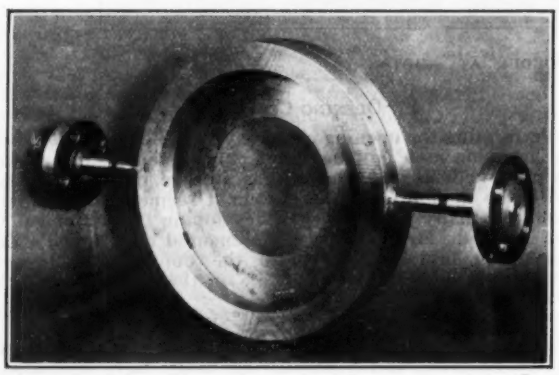


Fig. 2.

in the main pipe. The gas in the branch pipe is not led back there, but is measured, after being expanded, in small volume meters.

Rotary gas meters, which are much favoured in America and in countries that derive their supplies from there, are only little used here, as they cannot be calibrated as laid down in the calibration rules. They are, however, beginning to gain ground, owing to their simple design, and it may be assumed that the limitation as regards calibration will be gradually removed. The water type meters are, in fact, in greater part rotary meters, and have been previously in use. As regards box type meters, the Connersville meter has been introduced under the name of rotary piston meter. It has been adapted by Pintoch to the conditions over here, and has been provisionally passed by the authorities as suitable for calibration.

The gas meters which are most extensively used are the flow meters; they are of three types:

(1) With constant section of flow and with the differential pressure increasing with the quantity of gas. These are the actual differential pressure meters which are built in many designs.
(2) With nearly constant differential pressure and with variable section of flow. These are termed " float meters."
(3) A combination of the two. These are, however, little known, and do not present special advantages.

The differential pressure method of measurement is now universally used as being the most suitable standard method for gas measurement in high-pressure distribution systems. Quite apart from this, there has been a predilection for this mode of measurement. It has no limitation in regard to the gas to be measured or as regards pressure and temperature. The theoretical data upon which differential pressure measurements are based have been so thoroughly investigated during recent years that there

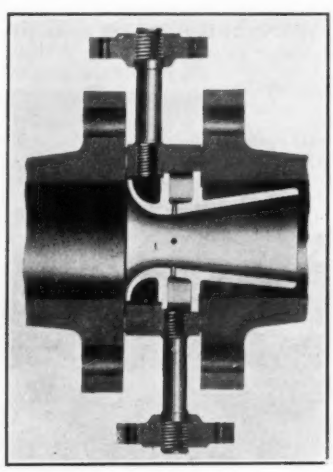


Fig. 3.

only remain a few points to be elucidated. The rules laid down for flow measurements by the Association of German Engineers prescribe all that is required by the engineer who is carrying out the measurements. The German standard nozzle, 1930, and the standard diaphragm, 1930 (figs. 1 and 2), made as specified in these rules, can be used without previous calibration. Instead of having simple drill holes, as was the case before, for taking the pressure, it is now the practice to provide ring slots in front and behind the throttling device. The type of apparatus built by Siemens & Halske has, furthermore, ring chambers. It is only in the case of small openings that the values of flow and the tolerances hold good for the different drill holes. The tests upon which the rules are based were carried out mainly at the works of the I. G. Farbenindustrie, and the results were checked there at many hundreds of measuring points. All other tests made in Germany and abroad were also taken into account.

Venturi Tube.

The Venturi tube has retained a special position. With this device it is not yet possible to dispense with calibration. Its advantage is the small permanent pressure loss, owing to the diffuser provided. This advantage is, however, negatived in most cases by the fact that the apparatus takes up considerable space, owing to its length. The so-called " nozzle fittings " or " Venturi fittings " fulfil the requirements of having both a small length and a small pressure loss. They are Venturi tubes, where the pressure is likewise recovered to a considerable extent (fig. 3), and where the outlet piece does not have to be extended as far as the wall of the pipe. The design best

suited for dealing with the differential pressure is, in the case of Venturi tubes, the ring type arrangement.

Very large Venturi tubes have to be calibrated *in situ* by means of an auxiliary measuring process. Water is used in most cases as the medium for this operation. The largest calibration plant of this description is owned by Messrs. Siemens and Halske. The highest load it can deal with is 5000 cub.m. per hour (175,000 c.ft.), the large quantities of water required being drawn from a tank with a capacity of 400 cub.m. (14,000 c.ft.).

It may be said that, in many respects, the ideal apparatus is the gas meter of the diaphragm type. It has, however, not yet been possible to produce a perfectly reliable design, and there seems to be little prospect of this being achieved for the time being. All materials used for diaphragms have proved unreliable after a while, and, in the case of metals, the distance transmission presents great difficulties. The advantage of the diaphragm resides in the fact that its weight is negligible as compared with the forces acting on it. A meter of the diaphragm type would also be suitable for pulsating flows of every description, under which conditions all other types of apparatus fail to work.

The oldest device for measuring quantities, which is based on the differential pressure method, is the diving bell meter. It is intended for very low static pressures, for, owing to the large displacement force, only a very small differential pressure is required, and, consequently, only small pressure losses occur.

The Ring Balance.

The differential pressure meter which is most popular at the present time is the ring balance (fig. 4). The principle on which this apparatus is based has long been known, but this meter had up till recently been little used. It was only in 1925 that a new design was brought out by Messrs. Hartmann & Braun, with considerable success. It is characterized by its great displacement force and by the relatively small space it requires. The deflection is independent of the quantity and of the specific weight of the fluid which the apparatus contains. The range of measurement can be varied over wide limits, by changing the re-setting weight. The various designs differ from each other, more especially in regard to the nature of the re-setting force and to the manner in which the root value is obtained. In the case of a balance ring balanced in every direction, an effective re-setting force is best attained by means of a zinc weight. The displacement of the ring is approximately proportional to the value measured (differential pressure) and the root value is obtained by means of a cam, on the periphery of the drum (fig. 5).

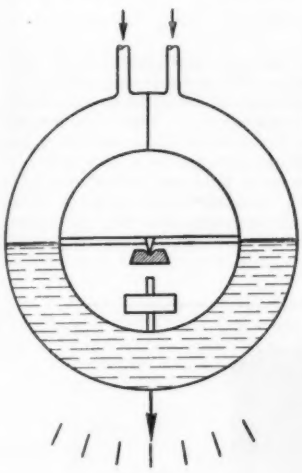


Fig. 4.

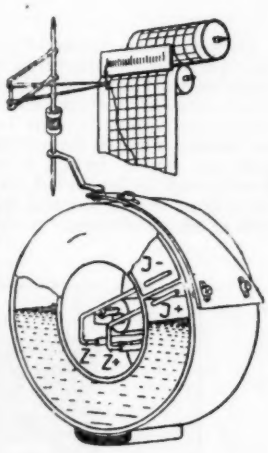


Fig. 5.

The ring balance is best suited in the case of low pressures. It then consists of a sheet metal ring with rectangular section. The fluid used for measuring purposes is water or oil. The pressure can amount to about 1 atm. (14·2 lbs. per sq.in.). The connections for the two pressure components consist of flexible rubber tubing, which does not interfere with the angular displacement of the ring.

The best shape of casing for the indicating ring balance is the circular design. The recording ring balances are arranged, as customary here, for recording on a moving strip. The co-ordinates are, of course, at right angles on the strip.

In view of the circular shape of the ring drum, the simplest course was to arrange for the tracing gear to record on a circular chart. The appearance is quite pleasing and the new mode of recording with radiating time divisions should be perfectly satisfactory. The measuring of the surface with a planimeter can be done quite as easily on a circular chart as on a recording strip. Over here importance is attached to having a linear graduation for the quantities, as the measurement of surfaces by means of a planimeter has not been superseded to such an extent as in America by automatic integrating gear. Our designs thus differ in this respect from most American designs.

If the ring balance is to be used for high pressures—that is to say, for more than 1 atm.—the sheet-metal casing has to be replaced by a ring with heavy walls, usually with circular section. The fluid used for filling the apparatus is then mercury. The connections are capillary tubes wound in coils; it is, of course, impossible to prevent them from interfering with the free rotation of the balance ring. This action can, it is true, be allowed for in the calibration; there is, however, always the danger that the coils may be accidentally bent. The balance ring has to be given a very large diameter, in order that the action of the coils should not be too much felt. The I. G. Farbenindustrie, for instance, build their ring balances with a diameter up to 1 m. (3 ft.) and use them even up to 1000 atm. (14,200 lbs. per sq.in.).

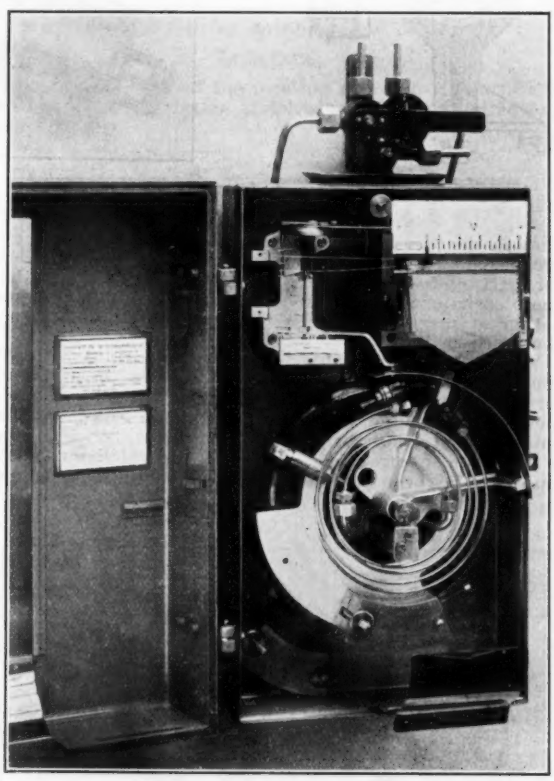


Fig. 6.

Indicating Float Gauge.

In order to meet the general requirements, it was therefore best to seek other means for differential pressure measurements, in the case of high pressures—*i.e.*, for values above 0·5 atm. (6 lbs. per sq.in.). The apparatus for use with gases at high pressures, which is best known, is the differential pressure gauge with float. Messrs. Siemens & Halske have made it one of the most efficient meters of the present day. Fig. 7 represents a section through an indicating float gauge. The apparatus consists of two containers, one inside the other, which are filled with the measuring fluid and are arranged as communicating containers. With cylindrical containers, the degree to which the float carried by the column of fluid in the inner container is raised is proportional to the differential pressure. In order to obtain a linear graduation as demanded over here even for indicating apparatus, the containers are given a parabolical or conical shape. The float rises first of all relatively quickly, the motion becoming slower as the differential pressure increases. The movement of the float is transmitted to the outer indicating device by means of a rack and through a magnetic coupling, which is shown separately in fig. 8. The arrangement is perfectly pressure tight.

In the case of a low differential pressure, with a value up to about 500 mm. W.G. (20 in. W.G.) the measuring fluid used is water. The sections of the containers are fairly large; the tube has a length up to ½ m. (1 ft. 7 in.). In the case of higher static pressures, higher differential pressures are also required. The limit of standard designs is about 1 atm. to 10 m. W.G. (14·2 lbs. per sq.in. to 32 in. W.G.). These high-pressure gauges have much narrower sections of container. The measuring fluid used is mercury, and, consequently, the length of the tube is not greater

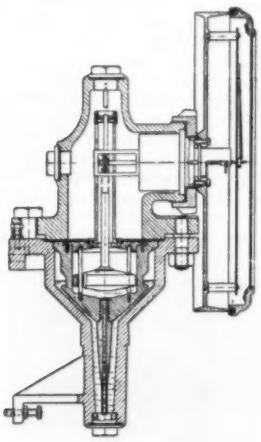


Fig. 7.

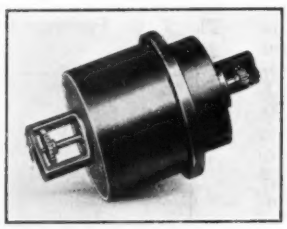


Fig. 8.

than in the case of medium pressure meters. These meters are provided with three-way cocks coupled to gear wheels for putting the meter into service and out of operation; these cocks open and close smoothly and cause the equalization of pressure between the two containers, when in the position " out of service."

With gas measurements, it is very important to have a continuous recording of quantities. When the usual uniform graduation of chart is used, the adding of surfaces by means of a planimeter presents no difficulty; it takes time, however, and, consequently, means additional cost. In view of this, the integrating gear usually provided in America has, of late, been introduced over here too. Mechanical

Fig. 9.

integrating gear presents the advantage of not requiring a separate source of power; the friction wheel gear used up to now has, however, nearly always proved unreliable. In view of this, the integrating gear represented in fig. 8 can be regarded as a marked advance in this connection. One of the two discs is fast and the other one is revolved by the rack of the float gauge. Both discs have notches along the periphery, into which a roller drops when the notches are side by side. It is only during this time, which is proportional to the distance up to the point where the notches are in the same position—*i.e.*, proportional to the value measured—that the integrating gear works.

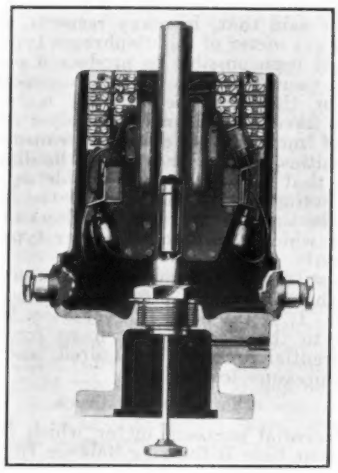


Fig. 10.

Owing to the requirements of high-pressure distribution, the question of providing electrical remote signalling devices on the indicators of mechanical measuring apparatus has received considerable attention. The mechanical measuring quantity can be converted into an electrical measuring quantity (current or pressure) in a number of different ways. In fig. 9 the ring tube on a high-pressure float gauge is provided with two mercury tipping tubes serving as maximum and minimum contacts, for the operation of alarm signals.

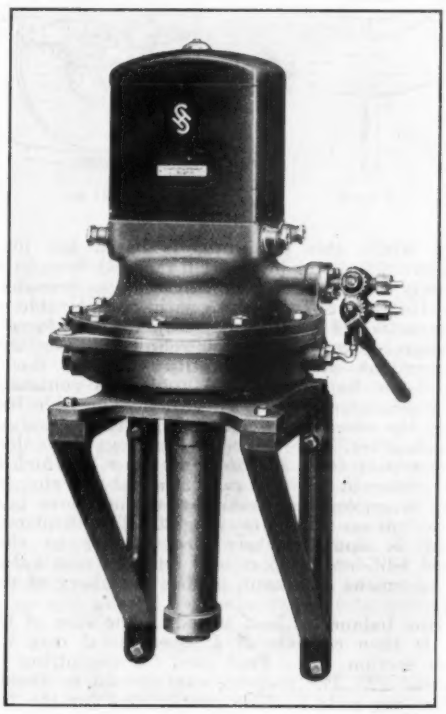


Fig. 11.

The signalling device in fig. 10 is for alternating current. The float of the gauge carries an iron core which, according to its position in the coil, induces a measuring current in the latter. In view of the vertical motion of the core, this device is specially suitable for " diving bell " and float gauges (fig. 11).

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Waverley Association of Gas Managers

ANNUAL MEETING IN EDINBURGH

The Waverley Association of Gas Managers held their annual meeting in the Goold Hall, St. Andrew's Square, Edinburgh, on Friday, June 23. The chair was occupied by the President of the Association, Mr. George Braidwood, Coatbridge.

The PRESIDENT, in opening the meeting, said that he was gratified to find such a large turn-out of members, and he wished to extend to them a very hearty welcome. Some of those present to-day had come long distances, and they had among them Mr. Rabbidge, from New Zealand, and Mr. G. P. Mitchell, of Worcester. Another visitor was Mr. J. K. Harrison, of Armagh, who said that he liked to come to these meetings because of their informality; and Mr. Braidwood remarked that he hoped that this pleasant informality would long be a feature of the meetings of the Waverley Association.

In referring to the loss sustained by the Association through the death of Mr. George Keillor, of Greenock, the President observed that nothing that he could say could lessen the sorrow they all felt.

The meeting then paid a silent tribute to the memory of Mr. Keillor.

The SECRETARY AND TREASURER, Mr. R. J. Philp (North Berwick), read the minutes of the last meeting, and after these had been adopted the following new members were admitted to the Association.

NEW MEMBERS.

Ordinary Members.—Messrs. J. B. Ferns, Hamilton; A. Millar, Kinross; R. J. Gavin, Melrose; Wm. M'Kinlay, Armadale; R. A. McLaren, Newton-on-Ayr; J. Bell, Stirling; J. S. M'Gill, Slamannan; A. S. Nisbet, Paisley; A. Walker, Kilbarchan; J. W. Napier, Alloa.

Extraordinary Members.—Messrs. M. Scott, Gibbons Bros., Ltd., Dudley; Staffs House, Durham; Wm. Gray, Messrs. James McKelvie, Edinburgh; R. Glover, West's Gas Improvement Company, Ltd., Manchester; W. Ford, Messrs. Stewarts & Lloyds, Ltd., Glasgow.

NEW OFFICERS.

The election of office bearers for next year was the next item on the agenda.

The PRESIDENT said that he proposed to ask Mr. G. P. Mitchell, of Worcester, to accept the Presidency for the coming year. Anyone who knew Mr. Mitchell would appreciate how well fitted he was to occupy such a position. He was not a stranger to them, as he had been in Scotland before going to Worcester.

Mr. MITCHELL, who had had experience in Port Glasgow and Falkirk, said that he found great difficulty in adequately expressing his appreciation of the great honour which had been bestowed on him. He had had a short stay in Scotland, and he always found it pleasant to return. He trusted that he would fill the position of President with the same dignity as had been witnessed in past years.

Mr. R. J. Philp was re-elected Secretary and Treasurer, and P. Blair, Haddington, and J. Richmond, Penicuik, were elected to the Committee.

PRESIDENTIAL ADDRESS.

The President then read his Presidential Address. This, and a report of the discussion which followed, will be found on later pages.

Mr. J. BELL (Dumbarton) said that, as immediate Past-President, it was his pleasant duty to present Mr. Braidwood with a memento of his year of office in the form of a Medal mounted on ribbon.

Mr. BRAIDWOOD, returning thanks, said that he would be proud to wear the Medal on his visit to Canada and America later in the year.

VOTE OF THANKS.

Mr. R. W. COWIE (Hawick), proposed a vote of thanks to the President and retiring members.

LUNCHEON.

At the conclusion of the meeting members adjourned to the North British Station Hotel where over a hundred had lunch together.

THE PRESIDENT.

GEORGE BRAIDWOOD, Coatbridge.

Mr. George Braidwood was trained under the late Mr. Alex. Wilson, M.Inst.C.E., at the Dawsholm and Temple Works of the Glasgow Gas Department. He was appointed Assistant Engineer and Manager at Coatbridge in 1910, and six years later succeeded the late Mr. Thomas Wilson as Engineer and Manager of the Company. Mr. Braidwood was closely associated with the early experiments in connection with the Wilson continuous intermittent vertical retorts. During his period at Coatbridge, the works of the Company have been modernized and additions made to the Company's area of supply. Mr. Braidwood is one of Scotland's representatives on the Executive Boards of the National Gas Council and the Federation of Gas Employers.

During the lunch the President presented the Auditor of the Association, Mr. J. O'Halloran, with a case of pipes and a tin of tobacco.

The PRESIDENT said that Mr. O'Halloran had been a member of the Waverley Association for 33 years, and during all that time he had only missed one meeting. He had been appointed Auditor in 1906, and since then the financial side of the Association had been in good hands. The present healthy state of the finances was due to the skilful and tactful work of Mr. O'Halloran.

Mr. O'HALLORAN thanked the President for his kind remarks, and the members for the way in which they had received them. If during his 33 years of membership he had rendered the Association any service, then he had been more than repaid in seeing the Association going from strength to strength.

Mr. G. P. MITCHELL proposed the toast of "Kindred Associations." He said that they had with them that day the President of the North British Association, Mr. A. S. Nisbet, of Paisley, a representative from New Zealand, and members from various other Associations. In the morning they had heard a lot about gas grids, but one of the most important links in the Industry was the bond which joined the various Associations together. This spirit of co-operation engendered the feeling of absolute confidence in the Industry.

Mr. A. S. NISBET, replying to the toast, said that in the Industry there were many Associations, but there was no diversity in the aim of these Associations; all were striving to advance the Gas Industry. In these days, when sentiment was being crushed out, Associations must, by reason of their common aim, be bound closer together.

Mr. J. W. NAPIER (Alloa) proposed the toast of "The President," and described Mr. Braidwood, on account of his character and strong individuality, as the Gladiator of the Scottish Gas Industry.

The PRESIDENT said that he had enjoyed his year of office to the utmost.

During the lunch the company were entertained by a song from Mr. J. D. Luck, of Carluke, and a humorous recitation by Mr. R. W. Cowie, of Hawick.

GOLF COMPETITION.

This was held over Longniddry Golf Course on June 22, with the following result:

SECTION I.

1st Handicap	A. H. Hamilton, junr, Glasgow
2nd and 3rd Handicap	Tie between J. H. MacKellar, Glasgow, and J. Galloway, Glasgow
4th and 5th Handicap	Tie between M. A. Waddell, South Queensferry, and P. Blackhall, Edinburgh
6th Handicap	R. B. Waddell, Polmont

SECTION II.

1st Handicap	T. F. Scott, Leslie
2nd Handicap	C. Hamilton, Loanhead
3rd and 4th Handicap	Tie between A. Brown, Edinburgh, and D. H. Munro, Glasgow
5th Handicap	James Bell, Dumbarton
6th Handicap	Thos. Borthwick, Glasgow

The scratch prize was won by Mr. John Pollock, of Glasgow, with the magnificent score of 72.

Design of Purifiers for the Removal of Hydrogen Sulphide from Town Gas by Iron Oxide

By "PROTEUS"

Although many attempts have been made to introduce new processes for the removal of hydrogen sulphide from town gas, iron oxide in its various forms is still almost universally employed and has been adopted in the latest mammoth gas producing plants in the Ruhr district of Germany, dealing, in the aggregate, with about 300 million c.ft. of gas per day. Apart from slight modifications, which have been introduced from time to time[1 and 2], practically no alterations have taken place since the inception of the process. The design of the plant in regard to size and arrangement is based on empirical data, which vary considerably according to different authorities, as may be seen from the following statement[3]:

A. MEADE:
0·5 sq. ft. per 1000 c.ft. gas per day
0·6-0·7 " " " " " (in absence of catch boxes)
0·8-0·85 " " " " " (to allow for growth of works)
1·5-1·7 " " " " " (for small works with prospects)
Depth of boxes 3 ft. to 6 ft. and 8 ft., according to capacity.
1½-2 cwt of oxide per 1·00 c.ft. per day in each of four boxes.
Depth in feet = 1·1 area.

CLEGG: 1 sq. ft. per 3600 c.ft. of gas per maximum day.

HUGHES: 1 sq. yard of sieve area per 1000 c.ft. of gas per maximum day.

COLSON: 1 c.ft. per 3760 c.ft. of gas per day.

F. LIVESEY: 1 sq. ft. per 2500 c.ft. of gas per day.

WYATT: 33 c.ft. (50 sq. ft.) per ton of coal carbonized.

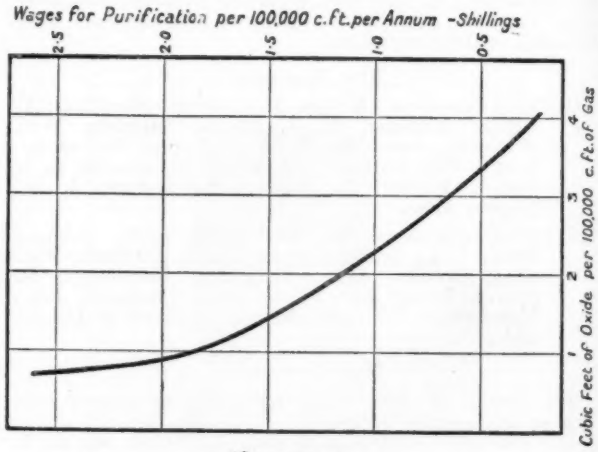
L. T. WRIGHT: 0·4 sq. ft. (8 vessels) per 1000 c.ft. of gas per day.

REISSNER: 1·17 sq. ft. per box per 1000 c.ft. of gas per day.

FRENCH RULE: Volume of oxide = 1/20 volume of gas per hour.

E. S. JONES: Volume of oxide = maximum volume of gas per hour $\times \frac{\text{grains of } H_2S \text{ in gas}}{4000}$.

In most cases only the cross-sectional area of the purifiers is specified, although in some instances reference is made to the depth of purifying material to be used. As the reactions which are occurring in the purifiers, whether they be those in the sulphiding or in the regenerative process, are taking place between a gas and a solid, they must depend mainly on the ratio of mass of material and volume of gas (hydrogen sulphide or oxygen) passing per unit time. This ratio represents the time contact. The cross-sectional area of the purifiers only affects the velocity of gas flow and hence determines the resistance of the plant to the flow of gas. Indeed, it has been demonstrated by Merz and Bössner[4] that a given quantity of purifying material purifies a definite volume of coal gas irrespective of the velocity of flow. The influence of the ratio of mass of purifying material and gas volume was the subject of a study by G. W. Anderson[5], who showed that the operating cost of gas purification is a function of this ratio, as indicated in fig. 1. He further deduced the economic optimum size of purifiers, for which the sum total of operating costs and capital charges was at a minimum. The economic size of a purifying plant working under average conditions was given as 3 to 4 c.ft. of purifying material per 100,000 c.ft. of gas treated per annum. Since that time the "rotation system" has been almost universally adopted, so that now only about half this size is necessary. As the results were based on the concentration of hydrogen sulphide of approximately 1% by volume, the size of plants treating gas of other concentrations of hydrogen sulphide should be different. This factor is taken into account in the following formula devised by Steere[6]:



—FIGURE 1.—

$$\text{Purifier capacity (c.ft. of gas per hour)} = \frac{3000 \times (D + C) \times A}{S}$$

Where D = total depth (in feet) of oxide, through which the gas passes consecutively in the purifier set;

C = plant factor, 4 for two-box, 8 for three-box, and 10 for four-box series respectively.
Where a single catch-box is used for two-box sets, the factor C = 6 should be used.

A = cross sectional area, in square feet of the oxide, through which the gas passes on its way through any one box in the series.

The quantity S is dependent on the H_2S content of the gas, but is not directly proportional to it. The following values of this factor are given for various H_2S contents:

Grains H_2S per 100 C.Ft.	Value of S.	Grains H_2S per 100 C.Ft.	Value of S.
1000 or more	720	500	560
900	700	400	525
800	675	300	500
700	640	200 or less	480
600	600		

This formula is widely used in America, where it has

been adopted more or less as a standard. It is, however, not without shortcomings, and meets modern requirements only in a limited way. For example, the product of area purifiers and depth of material is not a constant, so that the volume of purifying material in a plant depends on the assumptions made for the depth of the material or the cross-sectional area, as the case may be. Further, no account is taken of the characteristics of the material used, such as its activity and capacity, which differ appreciably between different oxides. It has, therefore, been found necessary to devise a formula which takes into account all the factors playing a part in the process.

Chemical Reactions Involved.

It is generally agreed that the principal reactions occurring during the purification of coal gas by means of oxide of iron are represented by the following equations:

(1) $3H_2S + Fe_2O_3 = 3H_2O + Fe_2S_3$
(2) $3H_2S + Fe_2O_3 = 3H_2O + 2FeS + S$
(3) $2Fe_2S_3 + 3O_2 = 2Fe_2O_3 + 6S$
(4) $4FeS + 3O_2 = 2Fe_2O_3 + 4S$

Numerous subsidiary reactions take place simultaneously involving other constituents of the gas, such as hydrogen cyanide, ammonia, and oxygen. In a recent publication[7] no fewer than 35 equations are given. For the purpose of the present discussion, however, attention is confined to the two reactions represented by equations (1) and (3). It has been shown by Gedel and others[8] that absorption of H_2S by iron oxide follows equation (1) under alkaline conditions, while the formation of ferrous sulphide according to equation (2) occurs under acid and neutral conditions. During revivification, ferric sulphide (Fe_2S_3) is readily oxidized to ferric oxide and sulphur. Ferrous sulphide is also converted to ferric oxide (Fe_2O_3) by oxygen, but can give rise to the formation of polysulphides, which cannot be revivified, and ferrous sulphate, under certain conditions of temperature. The ferrous sulphate behaves like an acid and liberates hydrogen sulphide (H_2S) from the sulphides present. In order to avoid loss of active material, and to prevent contamination of gas already purified with hydrogen sulphide, it is essential to adjust the process conditions to produce reaction (1). The following study is consequently confined to the reactions occurring under alkaline conditions, which should exist in all well-regulated purifying plants. Often the required degree of alkalinity is obtained by admitting a small quantity of ammonia, up to 5 grains per 100 c.ft. of gas, to the purifiers, but this is undesirable, as certain side reactions are set up, which interfere with the process. A purifying material such as "Lux" contains sufficient alkali to ensure an alkaline reaction throughout the whole of its useful life. This is a great advantage.

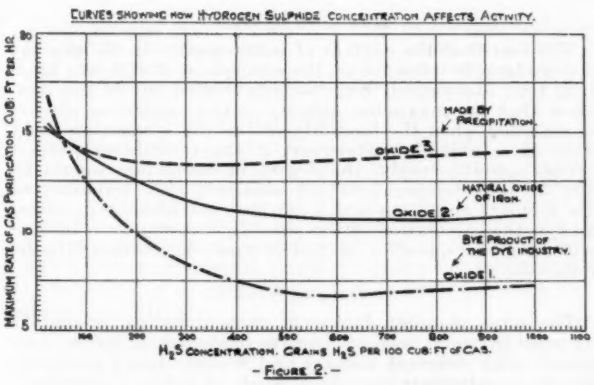
Mechanism of the Sulphiding Process.

The reaction represented by equation (1) is reversible—*i.e.*, water vapour reacts with ferric sulphide to form ferric oxide and hydrogen sulphide. The forward and reverse reactions come to an equilibrium, which is determined by the law of mass action and hence depends on the concentration of hydrogen sulphide and water vapour in the gas. In the purification process, true equilibrium is not reached, since the conditions are not static, and the time contact is limited. The rate of the reverse reaction (formation of H_2S from Fe_2S_3) is very slow at ordinary temperatures and only becomes appreciable at and above 100° to 110° F. This fact has been observed both experimentally and in plant operation[10]. For this reason the temperature in oxide purifiers should be kept below 100° F. In the removal of hydrogen sulphide from gas, therefore, the forward reaction is of primary importance, and this alone need be considered.

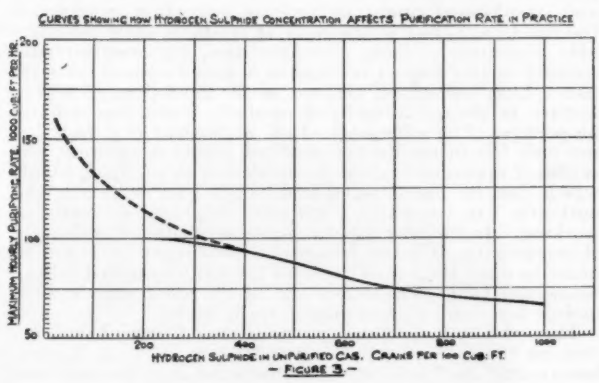
Factors Influencing the Absorption of Hydrogen Sulphide by Iron Oxide.

Reaction Velocity and Concentration of Hydrogen Sulphide.

According to the law of mass action, the velocity of absorption of hydrogen sulphide is proportional to the third power of its concentration in the gas, since, according to equation (1), three molecules take part in the reaction. As in most reactions between gases and solids, however, surface phenomena enter into the reaction and introduce complications. The rate of reaction is therefore governed by factors such as the nature and extent of the surface exposed per unit volume of purifying material, and the ability of the surface to adsorb moisture. Although little is known with regard to this aspect of the problem, it appears that the influence of the surface predominates and masks the effect of the concentration of hydrogen sulphide in the gas on the velocity of the reaction. Dunkley and Leitch concluded from their experiments[11] that, with the concentrations of hydrogen sulphide usually met with in practice, the rate of reaction (as indicated by the activity of the oxide) is either unaffected by the concentration of hydrogen sulphide or even slightly decreased with increasing concentration (see fig. 2). The question has been also examined by Milbourne[9], whose results are in fair agreement with those of Dunkley and Leitch. The introduction of the quantity S in Steere formula is an attempt

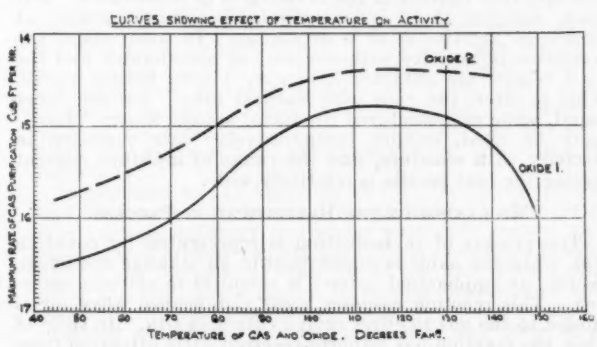

Curves showing how Hydrogen Sulphide concentration affects Activity.
Maximum rate of Gas Purification Cub. Ft per Hr.
Made by Precipitation.
Oxide 3.
Natural Oxide of Iron.
Oxide 2.
Bye Product of the Dye Industry.
Oxide 1.
H₂S Concentration. Grains H₂S per 100 Cub. Ft of Gas.
— Figure 2. —

to take the concentration into consideration, but is without theoretical foundation and is only an empirical factor of safety (fig. 3).


Curves showing how Hydrogen Sulphide Concentration affects Purification Rate in Practice
Maximum Hourly Purifying Rate 1000 Cub. Ft per Hr.
Hydrogen Sulphide in Unpurified Gas. Grains per 100 Cub. Ft.
— Figure 3. —

Temperature.

The influence of temperature on the sulphiding reaction has been studied by several investigators, and the importance of the control of temperature has long been appreciated in plant operation[13]. British experience seems to indicate that the best results are obtained by maintaining a temperature of 70° to 80° F. in the purifiers, and by avoiding fluctuations as far as possible[9]. American investigators, however, favour somewhat higher temperatures; Milbourne[9] concludes that 95° F. is the optimum. According to the work of Dunkley and Leitch[11] the velocity of absorption of hydrogen sulphide increases between 45° and 120° F. (fig. 4), but decreases slightly above 120° F. They con-


Curves showing effect of Temperature on Activity
Maximum Rate of Gas Purification Cub. Ft per Hr.
Oxide 2.
Oxide 1.
Temperature of Gas and Oxide. Degrees Fahr.
— Figure 4. —

sider the most favourable temperature to be about 100° F., as with the effect of changes in the concentration of hydrogen sulphide in the gas any variation of the velocity of the sulphiding reaction due to a change in temperature is partly masked by a simultaneous alteration in the reactivity of the iron oxide. The latter factor varies with the temperature

over different oxides, the variation being more pronounced with the natural bog-ores than with manufactured materials such as " Lux." This confers an advantage on such prepared materials, in that control of the temperature need not be so strict. The quantitative effect of changes in temperature, however, cannot be expressed in any formula, and, for purposes of design, it must be assumed that conditions are suitably adjusted.

Humidity of Gas.

The fact that the content of water-vapour in the gas has a considerable influence on the absorption of H_2S was for a long time overlooked. Experiments carried out in America[9] show that the maximum activity in the sulphiding process is obtained when the humidity of the gas is maintained at 65% of saturation. However, if the revivifying process occurs simultaneously, the degree of saturation should be 100%. Like temperature and alkalinity, the humidity of the gas is a condition which can be controlled in practice, and in the calculation of the size of plant requisite to deal with a given quantity of gas it must be assumed to be fulfilled.

Activity of Oxides.

The most complex factor in the sulphiding process is afforded by the " activity " of the oxide, which varies very widely with different natural and manufactured products. Numerous attempts have been made to define " activity " and to devise a method of assessing the ability of different purifying materials to remove H_2S from gas [9, 11, and 12]. The activity of an oxide is largely influenced by process conditions and certain properties of the material itself. Among these the alkalinity of the material, its moisture content, and its physical condition have an important bearing on the reaction. Most of the natural products show considerable variation in these characteristics, but greatest consistency in this respect is found in a manufactured material like " Lux," which on account of the conditions of manufacture is always a uniform product, possessing definite properties. The advantage of the uniformity of " Lux " is not only felt in the operation of the purifying process, but is also of appreciable value in the design of purifying plant, which can be based on definite data and will give the optimum size consistent with reliability and economy of working. In the absence of a purifying material of definite characteristics, a large factor of safety must be taken in order to meet the contingency of the oxide supplied falling below standard. The dimensions of the plant thus become unduly large and its cost unnecessarily high.

The value of an oxide as a purifying material depends first on the rate at which it reacts with H_2S. It is well-known that its " activity " in this sense is in no way connected with its ferric oxide content. It appears to be much rather a function of the molecular state of the oxide, as suggested by Weyman[14], and of the extent of the surface exposed according to other investigators[5 and 15]. Theory requires an increase of activity with an increase of surface per unit weight of material, and this requirement has been shown to be fulfilled by the greater activity of the more finely-divided oxides[13]. It has also been demonstrated that increased activity is obtained by the addition of chemically inert material, such as powdered glass, wood-dust, &c., the only effect of which is to distribute the oxide over a larger surface.

Moisture Content of Oxide.

The work of Dunkley[12] and others has established that the moisture content of the material is of importance. For each material there is an optimum moisture content, at which its activity is at a maximum. In some cases, the variation of activity with moisture is considerable and the best results are obtained only over a very limited range. This is often the case with natural ores. On the other hand, some manufactured products, among which " Lux " may be cited, exhibit comparatively little variation in activity with moisture, and the range of moisture content giving the best results is relatively wide.

MECHANISM OF THE REVIVIFICATION PROCESS.

The process of revivification is represented by equation (3), when the oxide is maintained in an alkaline condition, which, as emphasized before, is essential to efficient working. This reaction assumes great significance when air is added to the gas to effect revivification *in situ*. In spite of this, the reaction has hitherto received little attention from investigators. It is known that it is a much slower reaction than the sulphiding process, and *it is generally accepted as requiring three times as long*. At the same time, the evolution of heat is much greater than during sulphiding, so that the temperature in the purifiers must be carefully watched in plant operation, especially with an active material. Dunkley and Leitch[11] have shown that revivification does not affect the structure of an oxide, which returns to its original state after sulphiding. Milbourne[9] has gone more fully into the question. He has pointed out that, where revivification *in situ* is practised, the revivifying reaction is the dominating factor on account of its slowness. He has shown that the rate of revivification is practically independent of the concentration of oxygen in the gas, but greatly influenced by the humidity of the gas, reaching a maximum when the gas is saturated with water vapour. Therefore, process conditions should be adjusted to satisfy this point.

The effect of temperature is the same as in other chemical reactions, and the rate of oxidation of ferric sulphide increases rapidly with rising temperature. Too great a rise must be avoided, as this causes the purifying material to dry out and may lead to the formation of oxides of sulphur from the sulphur primarily produced. For this reason a temperature of 100° F. should not be exceeded.

It is advisable to separate the sulphiding process from the revivifying process, whereby better control of each is secured. This is effected by adopting the system of backward rotation, when air is introduced into the second box in series. In this way the sulphided material is subjected to the action of oxygen for three times as long as it is engaged in taking up hydrogen sulphide, and, with a material of suitable and reliable characteristics, purification is simplified and a spent material containing 50% of sulphur on the dry basis is readily obtainable.

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(To be concluded.)

Household Appliances in Colour.

At the Annual General Meeting of the Household Appliances Section of the London Chamber of Commerce, Inc., Mr. R. F. Wilson, F.R.S.A., of the British Colour Council, gave an address in which he said that for many years in every industry there had developed a tradition concerning colour, and each one, in nearly every case, had been working in a watertight compartment, regardless of what other industries were doing, although their products were used in conjunction with one another. To take an example, the colour " sky-blue " in one industry would mean a greenish blue, but in another industry it would be a blue inclining to the reddish side; the result was chaos. The Colour Council was established in order to set up standard colours and their nomenclature for every industry, and they were working in the closest co-operation with a large number of trades and with H.M. Consuls and Trade Commissioners in all the chief cities of the world.

In the domestic appliances section he realized that the trade was not subject to the vagaries of fashion, such as existed in the textile and hosiery trades, but he thought consideration should be given to the colour of door handles, dust-pans, gas stoves, electric irons, saucepans, &c., from the point of view of serviceability, cleanliness, and durability. Most of these articles were in use for some years and a frequent change of colour, according to fashion, was not called for, desirable, or practical. It therefore became necessary, first, for the housewife to decide on suitable colours according to her inclination, and, secondly, to be certain that she could correctly match them by replacements when a particular article required renewal. This raised a very difficult problem, for in practically every trade repeat orders given for the same colour in a particular material always showed some difference in shade. He thought that the closest co-operation should be maintained between manufacturers, wholesalers, and distributors to overcome this difficulty, so that standard colours could be drawn up, and if an order was given for, say, sky-blue, the purchaser could be certain that one particular blue would be delivered.

XUM

Presidential Address of George Braidwood, M.Inst.Gas E., of Coatbridge*

On occasion I have been accused of introducing into my criticisms of technical papers what has been termed "a fighting spirit." True or otherwise, the accusation raised the question as to whether or not Scotland, in general, and the Gas Industry in particular, were losing ground due largely to a lack of this very "fighting spirit." Men of the Lothians and the Borders have fought in the past for causes which were good, and some which were not so good, but never on any occasion have they failed to show that "fighting spirit," without which no great cause can be won.

For a century and a quarter the Gas Industry, made possible by the genius of that incomparable mechanic, Murdoch, has sailed along with a wet sheet and a flowing main. The fair wind has veered round slightly and has gradually become a head one. The smooth seas have become a little choppy, threshed by the noisy propellers of the "light" ship electricity. Our ships' sails must be trimmed accordingly. Fortunately, our young crew, technically educated, and with the benefit of a century of experience behind them, can be depended on to give the ship plenty of sea room and will not allow her to be taken aback.

The ship having voyaged so long with fair winds through calm seas requires her bottom to be scraped and the barnacles removed in order to keep her in position as leader of the fuel supply fleet. The important barnacle of legislation is now receiving belated attention. The removal of this will help to speed her. Casualness and apathy might, at this stage in the history of the Industry, wreck the ship, and should not be tolerated by her owners.

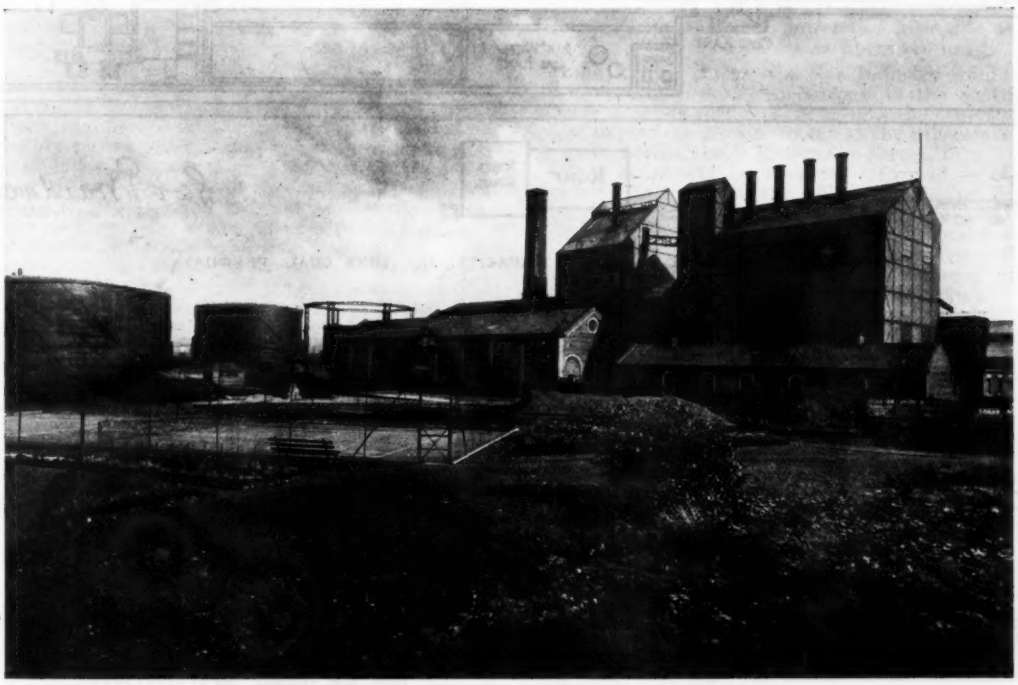
Enthusiasm and that fighting spirit necessary for her successful working must again be imbued in all of her crew. Head winds and choppy seas may just be the stimulus necessary to prove the sea-worthiness of the good ship Scottish Gas Industry.

We, in this country, are entering on a new era in the supply of light, heat, and power. The Gas Industry must, if it is to retain and enlarge that share of the load to which it is legitimately entitled, cast off that conservatism which has, in the past, been a drag on progress, take a broad view of the prospects ahead, and assume ordinary business risks. To-day the Industry requires men of vision, who can think ten years ahead, are able to see the economic possibilities of the position, and have sufficient knowledge and confidence to give a lead to the Industry and inspire courage and the fighting spirit in its personnel.

The Electrical Grid in Scotland.

At the beginning of this year the Central Electricity Board began trading operations in the Central Scotland area of the National Grid Scheme. The Board does not claim immediate success for the Grid, but states that by 1940 its success will become apparent. By next year the National Grid will be in full operation, and, it is claimed, will begin progressively to make up for the losses of previous years, a process which it is suggested will be completed by 1940.

The official view of the matter is that the policy of the Central Electricity Board is to provide electricity at a low stable price, and though this price is at present unremunerative, that is a point of comparative unimportance where a public service is concerned. Before the grid, however, can achieve the success its sponsors hoped for, much of the domestic lighting load, at present held by gas, would require to be captured by the electrical industry. By determined effort and with an educated public, alive to the additional benefits of gas lighting and the fact that the modern gas switch makes it as convenient as any other form, this business need not, however, be lost to the Gas Industry.

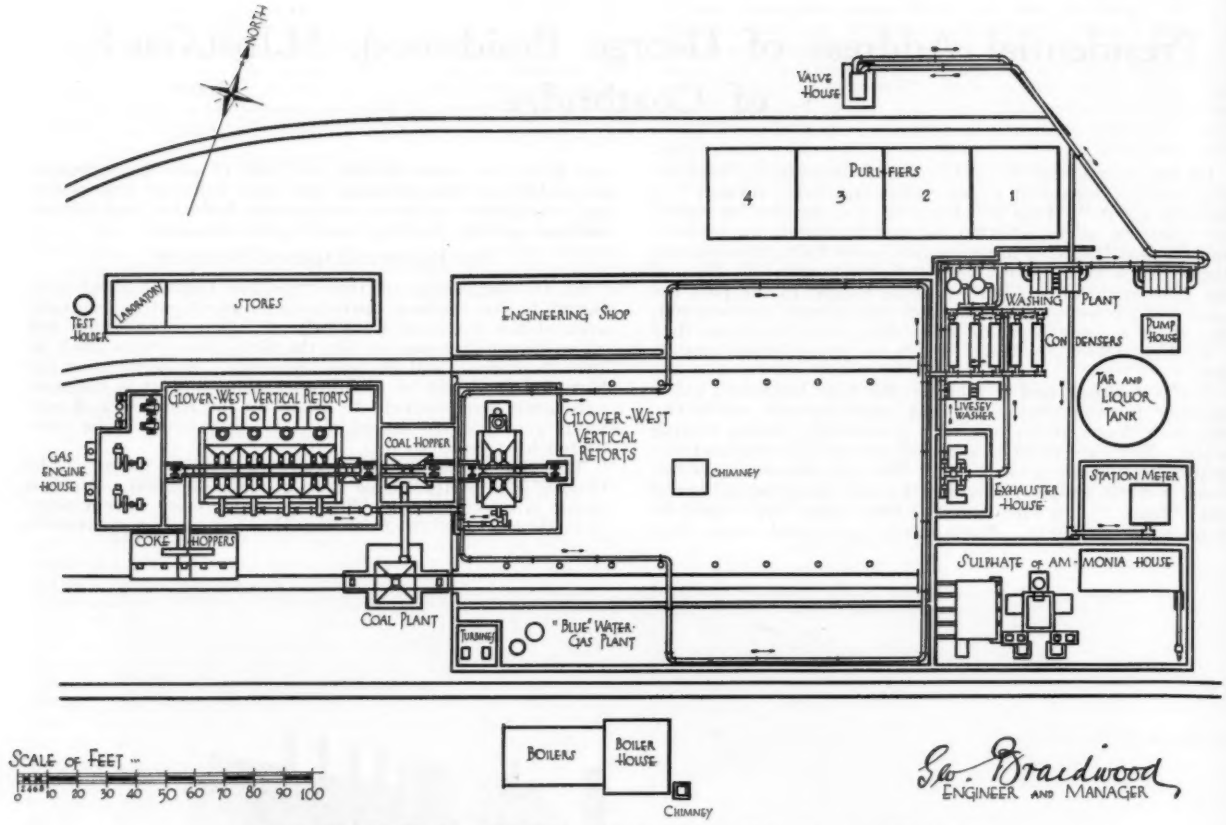


THE WORKS OF THE COATBRIDGE GAS COMPANY.

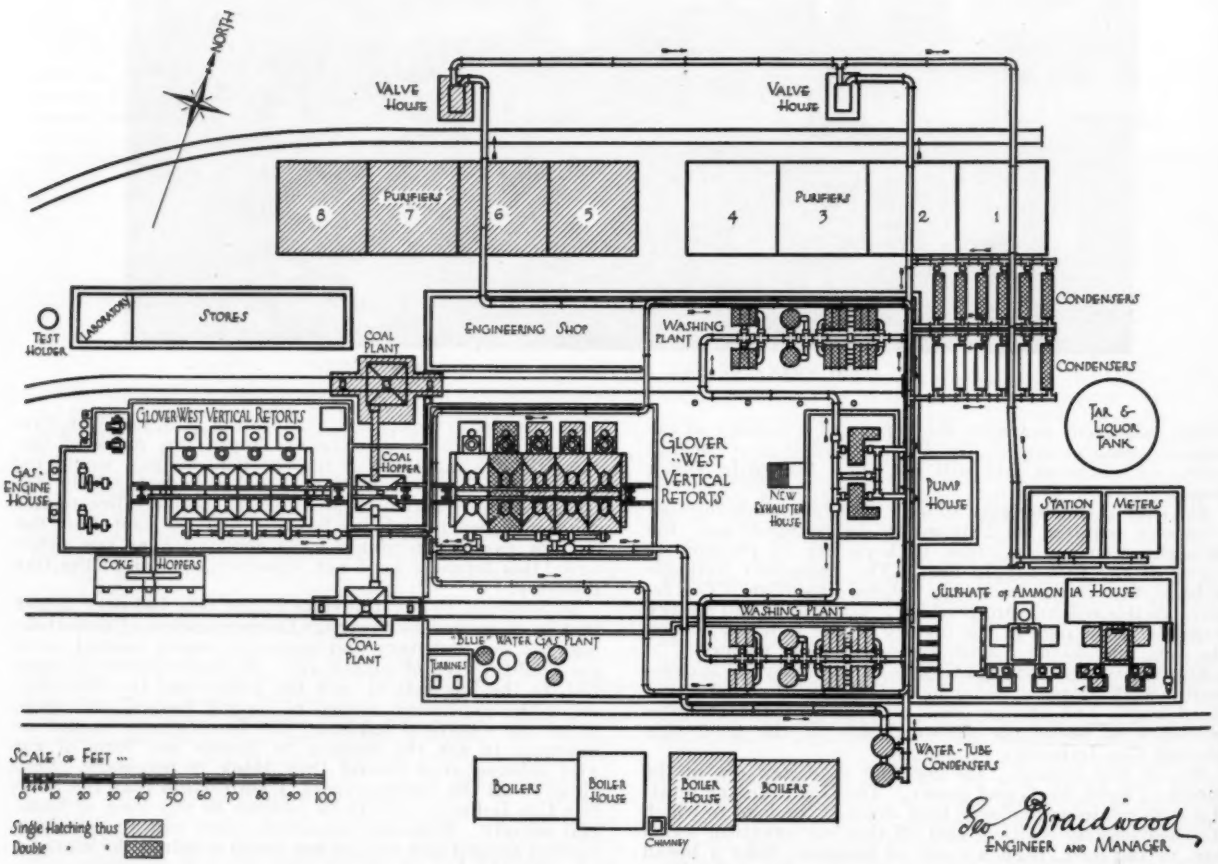
In Scotland to-day the state of the Gas Industry might best be described as chaotic. Large numbers of undertakings are non-statutory and under no proper control as to gas quality, area of supply, &c. Re-organization is essential, in the interests of both the public and the Industry. After the experience gained of having backed and sponsored the electrical industry, the Government cannot be expected to ask the country to finance any form of gas grid scheme even should they think it necessary. Considering all the circumstances, I am certain that the Scottish Gas Industry prefers its freedom to any form of financial subsidy. Economic soundness alone will guarantee its success against any competitor which required the stimulus of a subsidy dope.

If the Industry is to continue to make that rate of progress which it has maintained for many years, the most important object necessary to strive for in the re-organiza-

* Waverley Association of Gas Managers, June 23, 1933.



PLAN OF WORKS AS EXISTING. CAPACITY, 150 TONS COAL PER DAY.



PLAN OF WORKS SHOWING METHOD OF EXTENSION TO A CAPACITY OF 350 TONS COAL PER DAY.

NOTE.—The first extensions to a daily capacity of 200 tons are indicated by double cross hatching, and the final extensions to a capacity of 350 tons by single cross hatching.

tion is an all-round cheapening of the gas supply. Gas must be manufactured at a low price per therm, be of good quality, and be sold to the public at a reasonable price, one which will allow of good service being given in its distribution. That the desirable object of cheapening the general gas supply of Scotland could be attained, I am convinced, by a method very easy of application.

The Regional Gas Grid.

The method I would submit for the consideration of the Waverley Association of Gas Managers is that of a gas grid scheme on a Regional Basis, as opposed to a National one. Unlike the national distribution of electricity, that of gas provides quite a different problem. Gas of widely varying qualities is being manufactured throughout the country, and the Industry is far from being unanimous as to a suitable national standard of quality or even as to the necessity for one at all.

Gas distribution by means of grids on a Regional Basis would have all the advantages and few of the disadvantages of a National grid. Further, by the operation of regional grids, sufficient experience would be gained to enable a decision to be arrived at as to the adoption later of a national grid, if such should be, after all, considered desirable. I feel sure that the Industry could work out its own salvation on these lines without becoming a financial burden on the State and the general body of taxpayers.

With the introduction of regional gas grids and quality standards, the necessity for a *national* standard would not at present arise, and so this difficult practical problem would be solved. Quality standards, in my opinion, need not have a greater range than from, say, 450 to 500 B.Th.U. per c.ft.

In the operation of regional grids the most efficient statutory undertakings in the arranged regions, in a position to afford supplies, would be given by the Board of Trade statutory powers over those regions in order to permit of the laying of the necessary grid mains. Smaller undertakings in the regions would then act as distributors. The managers of these works, relieved of their manufacturing duties and worries, would be in a position to concentrate their energies and interests on distribution problems and salesmanship—phases of our business often sadly neglected simply for the lack of time. Owing to the cheaper cost of the bulk gas supply compared with that of manufacture by the smaller and less efficient undertakings, they would be in a position to retail the gas at a lower rate to their consumers without loss of profit to themselves. Isolated undertakings outside the range of bulk supply mains should be brought under the financial control of larger and more efficient concerns, who would be in a position to purchase and market materials more advantageously.

By the adoption of Regional Grid methods the cost of gas in the country would be reduced—an achievement impossible if the smaller and less efficient undertakings required to be purchased outright at often excessive capital values. Should the suggestion of Regional Grids be realized and the small concerns brought under the control of the larger and more efficient undertakings, they would without doubt find themselves able to compete for business on terms similar to those of their bigger neighbours. To quote the words of the poet Schiller, *the duty of all* is to

" Ever strive for the whole; and if no whole thou canst make thee,
Join, then, thyself to some whole, as a subservient limb!"

Government Attention.

There can be little doubt that the Government will very soon be forced by circumstances, chiefly connected with the coal industry, to turn its attention to the question of coal carbonization and the production of smokeless fuel and oil from coal. In view of this, it behoves the Gas Industry in Scotland to do its very best to put its own house in order now, before the job is taken out of its hands.

No member of the Waverley Association of Gas Managers would view with pleasure the nationalization of the Scottish Gas Industry. Many undertakings, who through force of circumstances find themselves producing gas inefficiently, could do much to avoid this calamity by facing the facts and arranging for supplies in bulk at economic terms. A financial arrangement, however, similar to that operating with the Electrical Grid, would require to be made, in order that the cost of necessary extensions required by the selected regional stations would not become a financial burden on their owners. Such financial arrangements would be made by a Central Gas Board, and the money subscribed by the consumers of gas only, not by the general body of taxpayers.

With regard to statutory undertakings likely to become at a later date the selected supply stations in the Regional Grid areas, they, in order to improve their efficiency, should keep themselves up-to-date. This may be done by acquiring all the advantages afforded them by recent legislation, particularly those powers which can, by special order, be granted through the Board of Trade, under the Gas Undertakings Acts, 1920-1932.

It is of interest to note that at Coatbridge it was considered necessary, in order to keep abreast of the times, to promote special orders in each of the four years, 1930, 1931, 1932, and 1933. One of the orders was chiefly concerned with finance, another was a bordering premises order, while the two latest have to do chiefly with area extensions and adjustments.

While the acquisition by the selected undertakings of suitable areas is necessary for the operation of regional grids, this is not by itself sufficient. The selected undertakings supplying the regions and from which bulk supplies would be drawn must be, beyond doubt, the most efficient. Further, they must be so situated that they may be enlarged in such a way as to be able to maintain that efficiency.

In order to meet the increasing demands for gas in its statutory area, the Coatbridge Company have, in recent years, at a cost of over £100,000, modernized their works, and that in such a way as to allow of extensions being made, in units of 50 tons daily carbonizing capacity, in the shortest possible time. The accompanying drawings show a plan of the works as existing, also one embracing the possible addition of four units. At present the carbonizing plant is operating on a load factor of 41·3%.

PART II.

" Oh wad some power the giftie gi'e us,
To see ourselves as ithers see us! "

Like Rabbie Burns, the Gas Industry would give much to have this power. The success of the Scottish Gas Industry depends very largely on how the others see us. The most important person, so far as the others are concerned, is undoubtedly the " Man-in-the-Street."

That he should be properly informed is of prime importance to the Industry. The poor fellow reads articles in his paper on Monday about Britain's £53,000,000 " White Elephant." On Tuesday about a proposed £400,000,000 national gas grid scheme alleged to be necessary to make the home manufacture of oil a financial success. On Wednesday about an " All Electric Scotland." On Thursday about " A Coal Utilization " movement. On Friday he reads of " Smokeless Fuel " and " Low-Temperature Carbonization." On Saturday he attends a lecture in the Heriot-Watt College and goes to bed at night full of " Therms." On Sunday he gets up with a headache and wonders what it is all about. Can anyone blame him?

Recently our wondering friend has had the case for low-temperature carbonization and the manufacture of smokeless fuel very ably put before him in the non-technical Press of the West of Scotland. This is as it should be, but in putting the case forward certain statements and opinions have been expressed which cannot be allowed to pass without comment. The advocates of smokeless fuel carbonizing methods suggest that the Gas Industry is seriously handicapping itself, and thereby failing to give the best service possible to the public, by its retention of certain hereditary prejudices. It is accused of having a liking for rich gas in preference to that of low quality.

It must be accepted as a fact that gas of from 450 to 500 B.Th.U. per c.ft. is the quality preferred by the Gas Industry. That the industry is justified in its preference for gas of higher thermal concentration, there can be no doubt. It has learned from experience that it is best that " guid gear should gang in sma' buik," and that gas of higher thermal concentration can be distributed and handled in a way calculated to give a town's supply best suited to the public. Further, the Industry can prove, as will be shown later in this address, that there is no need to manufacture low-grade gas with a high nitrogen content in order to produce the " therm " cheaply. In fact, it can be shown that the reverse is the case.

Again, it has been stated that the Industry, after an experience of twenty years, did not know what it cost to make smokeless fuel in vertical retorts. While this assertion is to a large extent correct, it can be shown that the Industry is not altogether lacking in this knowledge. It must be admitted that recently the Industry in Scotland, worried with accumulation of coke only suitable for industrial use, has devoted most of its attentions to methods of manufacture calculated to reduce the production of this class of material rather than to the production of smokeless fuel suitable for the domestic field. This fact, however, does not justify the suggestion that the Industry cannot produce satisfactory results in the manufacture, in vertical retorts, of smokeless fuel.

The Waverley Association of Gas Managers will learn with interest that an excellent smokeless fuel has been made in vertical retorts at Coatbridge during the past ten years. Further, when manufacturing gas of 475 B.Th.U. quality

as at present produced in the process, *the net cost of coal figure* is 0·34d. per therm.

Maximum Coal Throughput.

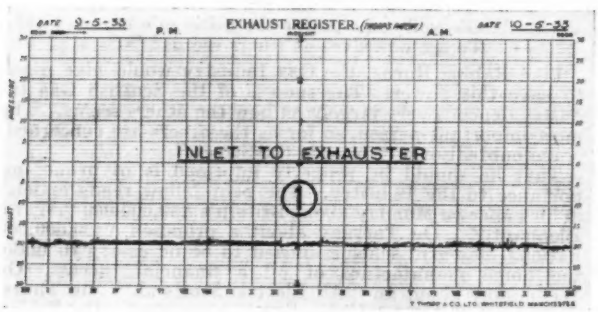
Having suggested a method of dealing with the sale of gas on a Regional Basis in order to cheapen the supply to the public, an endeavour will be made to explain the maximum coal throughput method of manufacture as employed by me at Coatbridge in order to obtain the low net cost of coal figure given above.

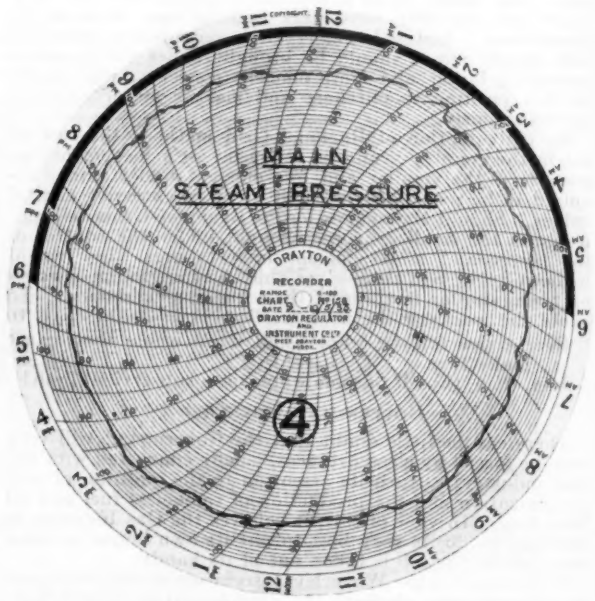
To explain my carbonizing theories and reply to the criticism of the carbonizing methods employed by the Gas Industry, it is necessary to deal with the subject from a financial point of view. Certain engineers abhor the idea of dealing with a technical problem from a financial angle, as if hard cash was indecent or immoral, but I believe that the yardstick of finance is the principal, and probably the only possible measure of the success or failure of any technical operation.

Being satisfied that calculations do help the gas engineer in arriving at the correct calorific value to declare, many years ago, in approaching this question, I felt somewhat like the student who had revised his most advanced class work, expecting to be examined on some difficult question. I was surprised to find the question to be answered a comparatively simple one, my chief difficulty being to avoid making comparisons on a " per ton " basis. Early in the calculations, I found, to my astonishment, that those showing the best gross financial yield per ton of coal carbonized showed the worst *net cost of coal* figure per therm produced when calculated on a year's gas output. I also found that the net cost of coal was the most important factor in making the low priced therm. How to obtain it is the problem to be solved.

In making the financial calculations the gas figures used must be in therms, and thinking in terms of results per ton should be avoided like the plague. If this instruction is kept in mind the rest is easy.

The first step in making the calculations is to note that the limiting factor is the total gaseous therms which it is possible to sell during a period of, say, one year. This is a very important point. It is only possible to sell that quantity of therms and this can only realize a certain sum of money. To make this point clear, a question asked by a critic in a letter to the Editor of a Scottish newspaper as to the working of a small municipal gas department might be used as an example of what is meant. The question he put to the gas consumers in his letter, and to which he himself suggested a reply was, whether it would have been better to sell an additional 8 therms per ton at 8·25d., equal to 5s. 6d. per ton, or make more char and residuals which only brought an additional income of 1s. 8d. per ton.





CARBONIZING CONTROL CHARTS.

In the first instance, the snag in the business, which must be realized before a proper reply can be given to such a question, is *that an extra 8 therms made on every ton of coal carbonized could not be sold.* In the works in question, the sale of gas is 283,500 therms per year or thereby, and the coal carbonized 4150 tons. With an increased yield of 4150 × 8 some 33,200 therms would be made, for which there would be no sale. Put in another way, with an increased yield of 8 therms per ton, to make 283,500 therms, only 3715 tons of coal would be required, resulting in the loss of residuals from some 435 tons of coal along with much lower residual returns per ton on the 3715 tons.

The Yardstick of Finance.

[METHODS OF COMPARISON.]

No. 1 "Per Ton" Method.
Coatbridge results.

	May, 1932.	£ s. d.	May, 1933.	£ s. d.
Total therms made	89,614		89,614	
Gas made per ton, therms	64·79 at 8d. per therm =	2 3 2·4	62·32 =	2 1 6·4
Smokeless fuel sold per ton, cwt.	9·27 at 16s. per ton =	0 7 4·9	10·01 =	0 8 0·1
Tar sold per ton, galls.	19·4 at 3d. per gall. =	0 4 10·2	18·77 =	0 4 8·3
		£2 15 5·5		£2 14 2·8

Difference = 1s. 2·7d. per ton in favour of the May, 1932, method of working.

No. 2 "Per Therm" Method.
Coatbridge results.

	May, 1932.	£	£	May, 1933.	£	£
Coal required to make 89,614 therms at 64·79 therms per ton	= 1,383 tons at 14s. =		968	Coal required at 62·32 therms per ton =	1,438 at 14s. =		1006
Coke sold = 1383 × 9·27 cwt.	= 641 tons at 16s. =	512		1438 × 10·01 =	720 at 16s. =	576	
Tar sold = 1383 × 19·4 galls.	= 26,830 galls. at 3d. =	335		1438 × 18·77 =	26,991 at 3d. =	338	
			847				914
Net cost of coal	=		£121				£92
Net cost per therm	=		0·324d.				0·246d.

Difference £29 (0·078d. per therm) in favour of the May, 1933, method of working.

Further, to illustrate this point, it is proposed to take the results per ton as shown in the following table from the Fuel Research Board's Report for the year ended March 31, 1932, on carbonization and gasification, and apply them to an assumed yearly make of gas of 15 million therms, in order to arrive at a financial conclusion as to which method of working is the better, and incidentally to find the *net cost of coal:*

—	No. 1.	No. 2.
Throughput of coal per retort per day, tons	7·5	10·0
Yields per ton of dry coal—		
Coke, cwt.	13·25	14·77
Tar, galls.	19·9	18·2
Gas, calorific value, B.Th.U./c.ft.	561	576
Gas, therms	56·72	42·16

In making such a calculation it must be recognized that gaseous yields per ton only enter into the financial calculation in so far as they determine the tonnage of coal required to make the 15 million therms, also that 15 million therms will only realize a certain sum of money no matter by what method the gas has been manufactured. Had the Fuel Research Board's tests been carried out on an ordinary gas-works using vertical retorts, a deduction from the coke figure of some 12½% would require to be made for producer firing, while probably only 75% of the remainder could be sold after screening over ¾-in. mesh screens.

The figures would then read, when applied to an assumed make of 15 million therms, as follows:

—	No. 1.	No. 2.
Thermal yield per ton	56·72	42·16
Coal required to make 15 million therms, tons	264,456	355,787
Cost of coal at 14s. per ton.	£185,119	£249,050
Coke yield per ton, cwt.	13·25	14·77
Coke available for sale per ton, cwt.	8·72	9·72
Total coke available for sale, tons	115,303	172,912
Total coke available at 16s.	£92,242	£138,329
Tar yield per ton, galls.	19·9	18·2
Total tar available for sale, tons	26,313	32,376
Tar at 50s. per ton	£65,782	£80,940
Net cost of coal	£27,095	£29,781
Net cost of coal per therm, pence.	0·434	0·476

As will be seen later, the resultant *net cost of coal per therm* figures of 0·434d. and 0·476d. bear an astonishing resemblance to the figure of 0·48d. per therm obtained when manufacturing smokeless fuel by the Maclaurin process, as shown in Table I.

TABLE I.—*Carbonizing Methods Compared.*

[Calculations based on assumed make of 15 million therms.]

—	Maclaurin Process.	Mother-well.	Greenock.	Falkirk.	Hamilton.	Glasgow.	Coat-bridge.	Edinburgh.
Calorific value of gas—B.Th.U.	233	400	410	430	440	470	475	500
Thermal yields per ton	69·9	78·4	83·8	84·1	74·0	73·2	65·48	76·4
Coal required to make 15 million therms—tons	214,590	191,320	178,990	178,360	202,700	204,920	229,070	196,330
Gross cost of coal at 14s. per ton	£150,210	£133,920	£125,290	£124,850	£141,850	£143,440	£160,350	£137,430
Coke sold per ton—cwt.	8·1	5·4	5·5	5·3	6·6	8·7	9·22	8·9
Total coke sold—tons	86,910	51,650	49,220	47,260	66,890	89,140	105,600	87,360
Revenue from coke at 16s. per ton	£69,530	£41,320	£39,370	£37 810	£53,510	£71,310	£84,480	£69,890
Tar sold per ton—galls.	16·16	17 0	19·0	18·2	16·0	15·3	19·05	15·8
Spirit sold ,, ,,	1·36	..	..	..	..	..	..	..
Total tar sold—tons	17,340	16,260	17,000	16,230	16,220	15,680	21,820	15,510
,, spirit ,,—galls.	292,000	..	..	..	..	..	..	..
Revenue from tar at 50s. per ton	£43,350	£40,650	£42,500	£40,570	£40,550	£39,200	£54,550	£38,780
,, ,, spirit at 6d. per gall.	£7,300	..	..	..	..	..	..	..
Net cost of coal	£30,030	£51,950	£43,420	£46,470	£47,830	£32,930	£21,320	£28,760
,, ,, per therm—pence	0·480	0·831	0·694	0·743	0·765	0·527	0·340	0·460
Gross financial return per ton*	£2 17s. 9d.	£3 0s. 10d.	£3 5s. 0d.	£3 4s. 10d.	£2 18s. 7d.	£2 19s. 7d	£2 15s. 9d.	£3 2s. 0d.
Carbonizing load factor	..	40·5	60·4	55·1	55·5	55·0	41·3	36·6

* Includes gas at 8d. per therm.

Gas, coal, coke and tar prices taken are the average paid and received at Coatbridge during the past 12 months.
200 gallons taken to equal 1 ton of tar.

As it is not possible in most works, when making gas of a fixed declared value, to operate carbonizing plant at all the different gas qualities and throughputs in order to obtain information, this must be sought for in the published returns of the different quality undertakings. This is very clearly stated in the publication known as the *Gas World* Analyses of Accounts.

Undertakings operating the same type of carbonizing plant, using similar coal, particularly if that plant be continuous vertical retorts, may reasonably be expected to show comparable manufacturing charges.

In order to arrive at some conclusion as to the accuracy of the claim that gas can be made in a smokeless fuel plant of the Maclaurin type at half the cost per therm at which it is possible to make it in vertical retorts, it is proposed to compare by the method just put forward the calculated financial results of seven Scottish undertakings with those it is possible to obtain by the Maclaurin process. The gas-works' results, used in the calculations, necessary for the production of an assumed make of 15 million therms have been obtained from the *Gas World* Analyses of Accounts for year ended 1931-32, while the figures used for the Maclaurin process are those given by the Fuel Research Board for year ended March 31, 1929. The gas qualities of the undertakings compared range from 233 B.Th.U. per c.ft. in the case of the Maclaurin gas to 500 B.Th.U. in the case of the Edinburgh quality. The results are given in Table I. and Chart I.

into the holder. In view of the controversy which recently raged in the Press regarding the decision of the Glasgow Gas Committee to abandon further gas-making by the Maclaurin process at Dalmarnock, it is of interest to note the comparative figures obtained by this method of financial calculation. The *net cost of coal per therm* given in the tabulated results using Coatbridge prices shows a difference of 0·047d. per therm in favour of the Maclaurin method of manufacture when making 233 B.Th.U. gas as compared

TABLE IA.—*Net Cost of Coal.*

PENCE PER THERM (SOLD).

[*Gas World* Analyses of Accounts.]

Undertakings. Calorific Value, B.Th.U.	Motherwell. 400	Greenock. 410	Falkirk. 430	Hamilton. 440	Glasgow. 470	Coatbridge. 475	Edinburgh. 500
Year.							
1925–26	1·52	1·54	1·28	0·22	1·95	0·32	1·89
1926–27	4·98	3·82	4·20	3·49	8·04	1·33	3·57
1927–28	1·12	0·83	0·69	*cr.* 0·42	1·23	0·02	0·98
1928–29	1·44	1·45	1·11	0·44	1·84	0·57	1·17
1929–30	1·39	1·48	1·20	0·92	1·81	0·65	1·33
1930–31	1·48	1·48	1·17	1·04	2·02	0·97	1·50
1931–32	1·42	1·44	1·27	0·85	2·10	..	1·07
Average	1·90	1·72	1·56	0·93	2·71	0·64	1·64

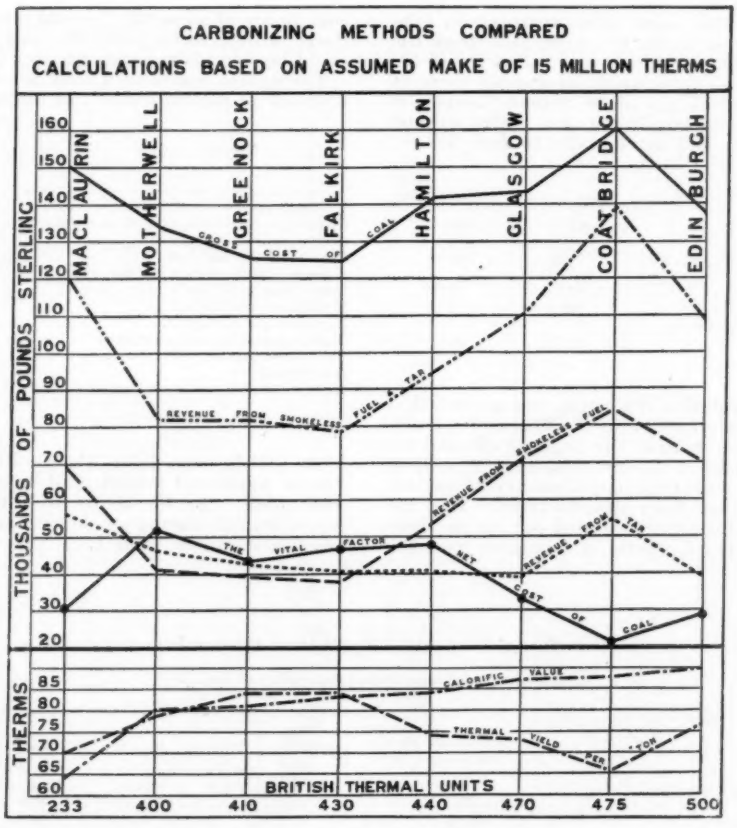


CHART I.

The calculations show that the therm can be manufactured in vertical retorts even by minimum coal throughput methods in the case of Edinburgh, manufacturing higher quality gas and industrial coke at a less cost than by the Maclaurin process. Further, by maximum coal throughput methods at Coatbridge, gas of 475 B.Th.U. quality is being made at a net cost of coal figure of 0·34d. per therm or 0·14d. less than by the Maclaurin process. Calculated on an output of 15 million therms, this means a figure of £8750 less on the year's net cost of coal.

The figures also show that with the prices for coal, coke, and tar as given the process giving the lowest thermal yield per ton can show the best *net cost of coal per therm* figure, and this despite the fact that its gross financial return per ton of coal carbonized is lowest of all the works tabulated.

Table IA. shows the actual returns of the works tabulated, and from this it is also seen that Coatbridge, producing the lowest thermal yield, shows the lowest average net cost of coal. Table IB. shows the actual net cost of gas per therm

TABLE IB.—*Net Cost of Gas into Holder.*

PENCE PER THERM (SOLD).

[*Gas World* Analyses of Accounts.]

Undertakings. Calorific Value, B.Th.U.	Motherwell. 400	Greenock. 410	Falkirk. 430	Hamilton. 440	Glasgow. 470	Coatbridge. 475	Edinburgh. 500
Year.							
1925–26	3·48	3·22	2·61	1·91	3·77	1·78	3·39
1926–27	6·84	5·65	5·77	5·33	10·25	2·75	4·91
1927–28	3·12	2·62	2·45	1·23	2·84	1·67	3·36
1928–29	3·42	2·83	2·73	2·09	3·33	2·03	3·19
1929–30	3·20	3·00	2·53	2·40	3·29	1·98	2·73
1930–31	2·86	2·93	2·65	2·64	3·55	2·38	2·71
1931–32	2·74	3·49	2·51	2·59	3·71	..	2·60
Average	3·66	3·39	3·03	2·60	4·39	2·07	3·27

TABLE II.—*The Vital Factors in the Manufacture of the Therm at Coatbridge.*

Year.	Coal.	Therms.	Coal.	Smokeless Fuel (Screened.)			Tar.			Residuals.	Coal.
	Cost per Ton.	Per Ton.	Cost per Therm.	Cwt. Sold.	Price per Ton.	Return per Therm.	Gallons Sold.	Price per Gallon.	Return per Therm.	Return per Therm.	Net Cost per Therm.
	s. d.		d.		s. d.	d.		d.	d.	d.	d.
1923. . .	20 9·30	68·29	3·65	8·90	24 5·63	1·94	18·78	4·95	1·36	3·30	0·35
1924. . .	24 10·25	66·90	4·45	9·78	31 11 80	2·80	18·33	4·84	1·33	4·13	0·32
1925. . .	22 6·71	65·39	4·14	9·78	32 4·39	2·90	18·27	2·46	0·68	3·58	0·56
1926. . .	18 5·25	67·70	3·26	9·32	21 11·83	1·82	18·57	2·98	0·81	2·63	0·63
1927. . .	31 8·31	71·21	5·34	8·62	35 0 9	2·55	17·59	5·42	1·34	3·89	1·45
1928. . .	16 7·26	66·05	3·01	9 57	19 2·4	1·67	18·66	3·98	1·12	2·79	0·22
1929. . .	16 9·60	72·92	2·76	9·31	19 7·8	1·50	17·85	1·99	0·48	1·98	0·78
1930. . .	16 6·38	66·50	2·98	9·47	19 5·4	1·66	19·40	1·99	0·58	2·24	0·74
1931. . .	16 7·15	66·11	3·01	9·12	18 7·8	1·54	19·46	1·96	0·57	2·11	0·90
1932. . .	16 8·44	65·48	3·06	9·22	17 7·4	1·50	19·05	2·43	0·70	2·20	0·86
Ten years' average .	20 1·86	67·65	3·566	9·31	24 0·54	1·988	18·59	3·30	0·897	2·885	0·681
To-day . .	14 0	65·48	2·565	9·22	16 0	1·352	19·05	3·00	0·873	2·223	0·340

NOTE.—No credit has been taken for sulphate of ammonia in any year.

with ordinary Glasgow practice making 470 B.Th.U. gas. This difference means £7833 on 40 million therms.

With this *vital figure* of net cost of coal per therm before you, questions as to the use of low-quality gas, the incidence of capital, values of oil, &c., may safely be left to others to discuss. By maximum coal throughput methods at carbonizing temperatures of 1100°-1150° C. and 9% steaming certain coals give a smokeless fuel with approximately 6% volatile matter. This fuel if of a free burning nature and when dry occupies 120 c.ft. to the ton and gives following screen analysis:

	%	%
Over 2 in.	62·5	
1½ in.—2 in.	11·4	
1 in.—1½ in.	11·4	
		85·3
½ in.—1 in.	7·0	
Under ½ in.	7·7	
		14·7
		100·0

It is eminently suited for domestic purposes.

The importance of proper coal selection is shown by the following screen analysis of ordinary non-coking double and treble nuts:

	%	%
Over 2 in.	24·6	
1½ in.—2 in.	23·1	
1 in.—1½ in.	25·6	
		73·3
½ in.—1 in.	15·4	
Under ½ in.	11·3	
		26·7
		100·0

financial benefit to itself, while, at the same time, greatly assisting the coal industry. Further, no results can be hoped for from an agitation against the burning of raw coal in domestic grates unless and until a plentiful supply of suitable smokeless fuel is made available.

That the public are ready and willing to avail themselves of such a supply, there can be little doubt, and the Industry could with profit turn its attention to the manufacture of a fuel suitable for their requirements, particularly now that the sale of coke for industrial purposes has become extremely difficult. To those Scottish engineers operating continuous vertical retorts, I would strongly suggest that a departure be made from minimum coal throughput and maximum gas per ton ideas, and a trial given to maximum coal throughput methods instead, paying particular attention to smokeless fuel production and quality, and net cost of coal. By this method of carbonization of Scottish coals in vertical retorts, gas of higher thermal concentration can be manufactured with ease, and that dread, under which many of the maximum gas yield engineers live, of being unable to maintain their declared values is removed.

If the highest possible thermal concentration is to be obtained, however, complete control must be maintained over the carbonizing process. The various factors, influencing the carbonizing conditions, are, at Coatbridge, automatically recorded as shown on the following 24-hour charts.

No. 1.—Vacuum at inlet to exhauster.
No. 2.—Pressure or vacuum at inlet to governor of No. 1 retort bench.
No. 3.—Pressure or vacuum at inlet to governor of No. 2 retort bench.
No. 4.—Steam pressure at boilers.

THE VITAL FACTORS IN THE MANUFACTURE OF THE THERM AT COATBRIDGE

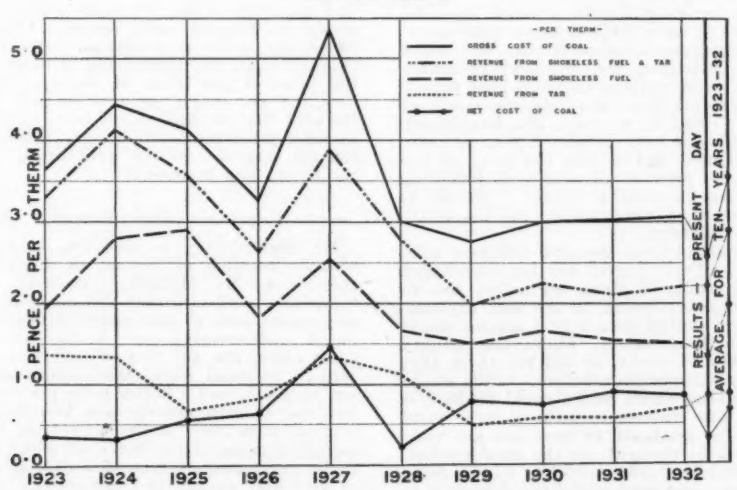


CHART II.

In view of the urgent necessity of supporting the "Coal Utilization Movement" it is pleasing to note that by the adoption of maximum coal throughput methods the Scottish Gas Industry may support such a movement with

In addition to these, close attention is paid to the maintenance of regular heats in the retort settings, to gas quality and composition and to temperature control of the gas from the retorts to the holders. Only by the most

careful supervision of all these details is it possible to obtain maximum efficiency in the carbonizing process.

The theory that *there should be no material reduction in the make of gas per ton* in the manufacture of smokeless fuel by high-temperature methods finds no support when the financial results obtained at Coatbridge by maximum coal throughput methods are studied.

The figures given in Table II. show that the yield of therms per ton of coal carbonized may be materially reduced with financial gain, because smokeless fuel and tar are vital factors in the manufacture of the low-priced therm. The vital factor results are shown in Table II., but may be more easily followed by reference to Chart II.

We are told that the Gas Industry is rapidly becoming more efficient because it shows an increase of 46% in the output of gas compared with 1913, and this with only 0·6% more coal used. This view has probably been accepted as correct by many gas engineers despite the fact that published statements prove that the therm is made at less cost by undertakings making the smallest yield of therms per ton of coal.

Would that technical and scientific people could be forced to apply the financial yardstick to their research results and so further guide the Industry of the country. Gentlemen, you are the men who form part of the crew of the good ship Scottish Gas Industry. You are expected to handle the ship with that fighting spirit and experience calculated to bring her safely through stormy seas with her cargo of " Therms " and an ever-improving supply service. That the ship with her barnacles removed and her modern rig will continue to lead the fuel supply fleet, I am convinced.

Whether the rig of " Regional Gas Supply Grids " and the fair wind of " Maximum Coal Throughput," as suggested by me now, are the best is for you to consider and decide. That the vociferous advocacy of subsidized electricity can be met calmly by the Gas Industry with success is certain, and this fact is calculated to inspire that air of confidence which always is the best trade wind.

Before cordially inviting you to criticize the address, it is my duty to tender thanks for the honour and privilege of being asked to act as your President and being allowed to address the oldest of all gas Associations—namely, the Waverley Association of Gas Managers.

Discussion.

Mr. J. W. McLusky (Glasgow) said that the address was far too good to discuss constructively without having had time previously to consider all the many points. One point to which he did object, however, was the use of the adjective " chaotic " applied to the Scottish Gas Industry. This might be liable to create a false impression of the Industry, which, down to the smallest works, was doing exceedingly fine work. To describe the Industry as legally behind the times was, he thought, much more correct, as they were undoubtedly hindered very much by administrative and legal restrictions. The Coatbridge plant, remarked Mr. McLusky, was of the ideal research size; and Mr. Braidwood had excellent opportunities to show others how things could be done. Coatbridge, producing gas with a low thermal yield per ton, of necessity produced more coke than other works where the thermal yield was higher; but coke had now become a burden, and in the last two years it had been disadvantageous to produce more coke than was needed. Would it not, suggested Mr. McLusky, be better to produce less coke and more gas? Already there were far too many coke ovens which had been built to anticipate an oil or benzole age which was still far distant. In concluding, Mr. McLusky congratulated Mr. Braidwood on his finely written and well read paper.

Mr. A. S. Nisbet (Paisley) said there was only one point, at the moment, on which he wished to question Mr. Braidwood. The price of coke at Coatbridge was given at 16s. per ton, and Mr. Nisbet wanted to know if this was the price at the works or if it was the average price of all coke sold, including rail transport. In concluding, he paid a tribute of thanks to Mr. Braidwood for contributing such a valuable address to the records of the Scottish Gas Industry.

Mr. D. Vass (Perth) remarked that gas grid schemes were limited to a great extent. In Perth a grid had been developed taking in villages within a radius of about six miles; but to go any further was impracticable owing to the cost of long-distance pipelines. In a more central area a grid scheme might be a success, but even in Lanarkshire, where the County Council had bought a number of works, he did not think that gas was being produced any cheaper than before. Grids would not be a success, he said, unless small works could be bought very cheaply. Whether it was cheaper to make a large yield of gas per ton and get less for residuals, or have low gas yield and more residuals depended, he thought, on the local market. The slump in the coke market had influenced him to cut down the coke production, and there had been very little difference in the financial results.

Cheap Thermal Energy.

Mr. J. Bell (Dumbarton) said that high-grade gas was the cheapest form of thermal energy, but the Coatbridge gas of a calorific value of 475 B.Th.U. could not be considered high grade; and he could make as cheap a therm at Dumbarton as was being made at Coatbridge. If he could buy his coal for 14s. per ton and get 16s. per ton for his coke, then he could make a substantial profit. He would like to see another table, similar to the one given by Mr. Braidwood, in which places making a high yield were compared. It seemed to him that the disparity between cost into the holder and selling price of the gas at Coatbridge was abnormal. The proper way to fight electrical grid schemes was not by reducing costs by fractional amounts, but by being able to supply gas at 6d. per therm.

Mr. G. P. Mitchell (Worcester) remarked that, working on a high thermal yield, he had got his cost into holder down to 1·54d. per therm, but could not reduce it to the figures given by Mr. Braidwood. With regard to difference between selling price and cost into the holder figures, Mr. Mitchell said that these were not reliable figures to take for comparative purposes, as they depended on which items were taken into consideration. Wages must be lower at Coatbridge than at other places. In reference to grid schemes, Mr. Mitchell said that there were certain districts in England where a grid would be advantageous. There was a scheme afoot in East Kent where the idea was not so much a linking-up of various works as an organization from which the smaller concerns would receive assistance in the matters of management and sales development.

Mr. J. W. Napier (Alloa) said that one matter to which he desired to refer was the position of small gas undertakings. The Final Report of the Legislation Committee, which would shortly receive sanction, would alter the domestic arrangements of small undertakings. Undertakings between 20 and 30 million would not be required to conform with the regulations unless local authorities had reason to enforce this change. Undertakings over 30 million would require to become statutory, but five years would be allowed to make any alterations necessary. Such a change-over would put the Scottish Gas Industry on a better and sounder footing. Mr. Napier said that he was intimately acquainted with the prospects of a grid scheme in Scotland, having already discussed the practical and economic side of such a proposal. This could only be an economic success if gas could then be produced cheaper. The financial backing required to acquire small undertakings over a wide area could not be found. Small undertakings with vested interests could not be bought at a price equal to their value; and this debt would be a heavy burden on the new concern. He did not see how this difficulty was going to be overcome, but he did not think that Mr. Braidwood's suggestion of a Central Board for which the money would be subscribed by consumers would meet the case. Re-organization must take place from within the Industry, and to this end shareholders must co-ordinate their interests. They must face the fact that small undertakings, situated near coalfields, could make gas almost as cheaply as larger undertakings, and this would constitute real opposition to the acquisition of such concerns. In this respect gas was at a disadvantage as compared with electricity, as the latter started on fresh ground.

Mr. D. Fulton (Helensburgh) criticized Mr. Braidwood for having viewed his subject from one angle with one eye. He said that figures could prove anything or nothing, as they could be contrived to suit the argument. The figures for May, 1932 and 1933, showed a small reduction in favour of the latter year, but these figures were not comparable, as the coal used was different and most probably would not have the same volatile matter and ash content. He did not believe that a reduction in the thermal yield would increase the yield of coke as much as had been stated, though the increase in tar yield he considered more probable. He stated that the prices given for coal and residuals depended largely on geographical situation, and that if Coatbridge could be suddenly transported north-west of Helensburgh it would be found that the coal would cost more and the value of the residuals would be less, so that the figures would be twisted right round. This was not a subject on which one could be dogmatic. Another point which might be overlooked in the production of a low thermal yield was that the price of gas must be increased by the increased cost of handling the larger amount of coal used and coke produced. He said that he had found by a rough calculation that if the thermal yield were still further reduced to 50 therms per ton, the net cost of coal was still further reduced, but the cost of the therm had increased.

The Author's Reply.

Mr. Braidwood, in replying, said that he appreciated his unusual position of having, in this case, the last word. He referred to Mr. McLusky's criticism of the use of the word " chaotic," and said that this did not apply to the management or organization of gas undertakings, but to legal restrictions. Small undertakings were being run very efficiently, and, in some cases, the net cost of coal was as low as in larger concerns. In small works the amount of residuals produced was not so great, and a better price per ton was obtained for them, but the maintenance charges were high. It seemed to be the general view that a Regional Grid Scheme would not be a success because of the fact that small undertakings would have to be purchased at increased capital value; but his idea was to give bulk supply to these smaller works. He reminded Mr. Vass that he could obtain from the Board of Trade a differential rate on any further extension which he made. He had been criticized for advocating the manufacture of more coke at a time when there was a slump in the coke market, but the coke which he was producing at Coatbridge was not the usual industrial coke, but was suitable for domestic use. This therefore opened up a field which had hitherto not been touched. Mr. Bell, in considering the price of coal used and the price

obtained for coke, had made the mistake of thinking in terms per ton carbonized. He admitted that the difference between net cost into the holder and selling price seemed high, but reminded members that municipal concerns could sell cheaper because their capital expenditure had been reduced by the high price charged in previous years. Mr. Fulton had accused him of looking at the subject with one eye, but he had looked to good purpose, as his results for the past ten years compared with any concern in the kingdom. Increase in the price of his coal would alter his calculations, but he still thought that a high coke yield would be profitable. In replying to Mr. Nisbet, Mr. Braidwood said that the figure of 16s. per ton for coke was the average figure for the year after deducting the rail charges, and that he could have sold three times the quantity of coke.

Time did not permit Mr. Braidwood to deal with all the questions, but, in concluding, he said that a financier could not be expected to buy small concerns at values above par, and that a grid scheme must be brought about by organization from within the Industry.

South Metropolitan Company's Co-Partnership Festival

A very large attendance and a varied programme of sporting events and entertainments marked the occasion of the annual Co-Partnership Festival of the South Metropolitan Gas Company, held at the Crystal Palace on Saturday, June 24 last.

Apart from the ever-present interest and amusement provided in the Palace itself and in the magnificent grounds, the Company had arranged a very full round of activity for co-partners and their families, including swimming races, sporting events, displays of Swedish Drill, concerts, dancing, and organ recitals.

During the course of the evening the prizes for the various sporting events were distributed to the winners in the centre transept of the Palace by the President of the Company, Dr. Charles Carpenter, C.B.E., who took the opportunity of addressing those present.

Dr. Carpenter Addresses Co-Partners.

Co-Partner-Ladies and -Gentlemen,

It once more falls to my lot at this stage of our Co-Partnership-Day's proceedings to interpose a few words of welcome and reminder. The welcome is on behalf of the Board of Management, who carry on to-day among their other duties that of administering a deed of co-partnership between consumer, shareholder, and employee, to which their predecessors put their hand and seal just on forty-four years ago. During that period, long in the lifetime of the individual, short in that of the community, there have come about many changes in the relationship of State and people in matters pertaining to industry. But in all those changes there has been nothing which has been shown to be unsound in the policy this Company has so long followed towards its employees, and which we have met here to-day to celebrate. It is important to recall to your minds that in carrying this out it has set up a medical oversight of their conditions of labour; it has provided an organization not only of their employment, but of such portion of their leisure as may be desired by them, accepting as true the adage that "All work and no play may make Jack a dullard" (and I must not forget that Jill, too, figures largely upon our pay-sheet); it has given yearly holidays without loss of pay; shouldered at least one-half the cost of pensions in old age; and last but not least rewarded faithful and intelligent service by sharing equally with its staff and its stockholders part of the profit it makes by the intelligent conduct of its business.

I am old enough to remember the time when the efforts of this Company to promote harmony between employer and employed were misunderstood by a large section of the general public as well as by some members of the churches and their laity. But time has proved that those doubts were unfounded, and has vindicated beliefs which when they were put forward were regarded not only as startling and unusual, but as detrimental and obnoxious. In other ways Time has not been so kind, as when, for instance, he reminds us that the hour has arrived for some devoted fighter for co-partnership to put off his armour and give over the battle.

Mr. Theobald's Retirement.

One such instance which I very deeply regret is the coming retirement of the Secretary of our Co-Partnership, Mr. W. A. S. Theobald, who has been associated with it and has been its devoted guardian throughout its long existence. If without risk of seeming irreligious I can reuse a designation of co-partnership which I was once gratified to hear—namely, that it is almost a religion among our people, then I can say of Mr. Theobald that in the practice of the principles of co-partnership he has acted almost as its high priest. We shall miss his services too in relation to the Livesey Trust, founded some five-and-twenty years ago to give assistance to former employees and dependants, in the administration of which Mr. Theobald has taken continued interest and exercised unremitting care in the just allocation of its income, not, unfortunately, as adequate as one could wish to meet the increased demands upon it which time has brought about.

To-day, as you know, is one of official welcome by the Company through its Board of Management. To employees of all ranks, engineers and engine drivers, superintendents and stokers, clerks and collectors, meter readers and mechanics, accountants and artizans, this festival is given that once a year co-partners may have an opportunity whether they be highly or lowly placed to meet and take pleasure together, and thereby show their pride in the organization of which they form a part.

Electrical Competition.

So much, then, by way of welcome to the festival. I should not be faithful to my trust were I not to add thereto a reminder. We have not a monopoly in the public supply of light, heat, and power, such as we possessed when our co-partnership came into being. Political reasons have impelled our rulers to create a combine of the generators of electrical energy. I should be the last person to complain of such a combination if it stood upon its merits and competed upon equal terms with its over-a-century old opponent. But when that huge device shows signs of not fulfilling the promises made by its protagonists, and when to bolster it up officialdom turns aside from giving equal opportunity for the public to make its own choice as to whether it will use electricity, or oil, or candles, or even gas, to do the work of lighting up our homes, our shops, and our workrooms, then it is high time to protest, and that you too, ladies and gentlemen, should not remain in the dark as regards the speciousness of the proposals for our undoing.

Politicians promised that the electric grid would revolutionize the industrial and agricultural face of this country, that it would put an end to unemployment, and enable this country to take its place once more among the manufacturing and agricultural nations. Has the extended use of electric energy contributed one iota to reduce unemployment or to raise the standard of existence in this country? I suggest it has done nothing to enable by its promises of a cheapened and standardized supply, to rectify the distress from which the country is suffering. How much more deeply seated was the trouble than was realized is shown by the fact that all the nations from the four corners of the earth are gathered here in conference to seek some common remedy for the disease, and for which electric grids are not even mentioned.

Such improvement as has come about in industrial conditions in the country has been the result not of the grid, but of the tariffs. It is the walls we are building up round the coasts of our land, not the pylons carrying wires across it, that have been making what little improvement is apparent. The trouble is that when the uselessness of the scheme for its purpose is discovered it may be turned as a weapon against us and our great established industry, and used regardless of cost or of justice, or of fairness to damage us by taking away as much as possible of the demand for light, heat, and power, as we now supply so satisfactorily.

Freedom of Choice.

By a recent overwhelming vote in the House of Commons the nation's representatives have indicated in unmistakable terms the justice of the Gas Industry's demand that the consumer alone should be the judge whether he takes gas or electricity, either or both, to supply his wants. It is up to you all to press home to those with whom you come into contact the absolute fairness of the cause which is ours to-day—namely, freedom for gas supply and use.

But I must not this evening dwell too much upon our difficulties. The day is one of festival and rejoicing, and

more perhaps than to any of those present this year in which it falls is for me an outstanding one in that it contains two memorable anniversaries in a career for the fruit-bearing of which I have largely to thank not only co-partners past and present, but their forbears in bygone days when co-partnership was unknown. To them I tender my heartfelt gratitude for the favours I have received by their teaching, counsel, advice, and service. During my long journey through life I have not hesitated to step aside when need arose and help anyone of them if I felt able to do so. Perhaps this is why I have been able to keep upon the road so long. Who can say?

Corporation Undertakings' Results

Bangor.

A gross profit of £4961 has been made, as against £3851 for the previous year, resulting in a net deficiency amounting to £159, as compared with £4 for 1931-32. The consumption of gas was about 100,000 c.ft. less than last year. It has been decided to make application to the Ministry of Health for sanction to borrow £1000 to meet prospective expenditure on gas cookers and meters.

Bolton.

The gross profit for the year is £64,268, this being £7235 greater than for last year. Of this amount £6521 has been allocated as contribution to capital account and £6327 has been expended on renewals. The returns for residuals show an increase of 0·93d. per 1000 c.ft. sold on last year's figures. This represents an actual increase in revenue of £4955. The sales of gas for the year (1,281,253,000 c.ft. were made) show an increase over last year of approximately 12½ million c.ft., or 1·06%. During the year the whole of the load was carried successfully by the Gas Street Station. This, however, has offered some difficulty during the past winter. The Gas Street No. 1 retort setting has reached the end of its useful life and is now being rebuilt. The Committee have placed a contract with Messrs. Woodall-Duckham Company, Ltd., for the rebuilding of the setting, and the work is now well in hand. The retorts are to be built on the upwardly-heated system. This work is being carried out during the present summer and has found welcome employment for many local men.

Burton-on-Trent.

The total revenue for the period was £96,471, and the working expenses £76,347, the gross profit being £20,124. After meeting loan charges and other items, the net surplus for the year was £1965, as compared with a deficit of £1104 last year. The deficit carried forward last year was £12,453, which has now been reduced by last year's surplus to £10,489. The consumption of gas in the year had been 1,334,868 therms, or 383,288,000 c.ft., a decrease of 10,728,000 c.ft., or 2·70%. The sale of residuals showed reductions of 282 tons of coke, 13,327 gallons of tar, and 77 tons of ammoniacal liquor. There were 14,494 consumers on the books, of whom 10,222 had prepayment meters. The total of unaccounted-for gas during the past year was only 3·33% of the make, against 4·86% during the previous year, while the yield of gas per ton of coal carbonized was higher for the year, being 74·7 therms, compared with 72·68 therms for the previous year. The number of consumers and the average consumption per consumer also showed an increase during the year.

Carlisle.

During the year the trunk mains have been extended in the areas of the City's Housing Schemes; also to the village of Cotehill and to premises at Cardew and Dalston. The total main mileage is now approximately 141 miles. The quantity of gas made during the year under review is approximately 10 million c.ft. in excess of that of the preceding year. A total of 2111 gas appliances were fixed during the year. The yield of coke and breeze (19,937 tons) is equal to 12·72 cwt. per ton coal carbonized, and the quantity sold (14,347 tons) has realized £9794, a decrease of £599 on last year's figure. The price of tar, 2436 tons of which were made during the year, shows an increase over last year, thus accounting for the improvement in revenue of £2067 from this source. The financial results for the year, after providing for income-tax, interest, loans repayment, &c., show a net profit of £6461, as against a net profit of £1280 for the preceding year. The figures relating to gas made and sold, compared with 1932, are as follows:

	1932-33. C.Ft.		1931-32. C.Ft.
Gas made.	604,372,000	..	594,767,000
Gas sold (private rental)	530,072,300	..	513,484,300

Dukinfield.

The operations of the past year show a profit of £1896, and during the last seven years have repaid from the cost of the new retorts £11,900. Showrooms for gas appliances have been established at the Town Hall and at the cashier's old office in Charles Street.

Heywood.

The balance-sheet shows that the gross revenue amounted to £33,732, and the gross expenditure (less interest and sinking fund) to £23,591, leaving a gross profit of £10,141, and, including £8502 interest and sinking fund, a net profit of £1638, as against a profit last year of £1209. The total capital expended during the year amounted to £1145, made up of £1051 on prepayment meters, and £93 for the extension of a 3-in. cast-iron main. The total quantity of gas manufactured was 699,304·5 therms, of which 39,712·5 therms was carburetted water gas. During the year 8025 tons of coal have been carbonized giving an average make per ton of 82·19, against 80·90 therms last year. The total sales of gas amounted to 624,663·97 therms, an increase of 2·77% over 1932, which constitutes a record in the history of the Undertaking. The maximum output of 616,121 therms was reached in 1914, after which a regular decrease was recorded year by year until 1919, sales then amounting to only 542,637 therms. Since that time, however, steady progress has been made, the increase from 1919 to 1933 being 15·11%. During the period under review 313 consumers' services and 49 lamp services have been renewed in addition to the laying of 119 new consumers' services. The quantity of coke sold was 2357 tons, as against 2362 tons in 1932, while the net receipts show a reduction of £36. The receipts from tar have improved, being £80 more than in 1932, and should be considerably better during the current year.

Sedgley.

A net profit of £1787 is reported, compared with £1241 in the previous year. The accounts of the undertaking show that the total revenue from all sources was £18,693, and the total cost of manufacture and distribution of gas amounted to £14,124, leaving a gross profit of £4368, of which £2781 was expended in repayment of loans and interest. The gas-works are being extended, and it is hoped that the new plant will be in operation in the autumn.

Stourbridge.

The sales of gas show increases amounting to about 2½ million c.ft., as compared with last year. The gas unaccounted for is slightly reduced from 6·18% to 6·12%. The revenue account expenses are normal, rates and taxes again showing a satisfactory decrease. The income from the sale of gas has increased by about £900. Meter and stove rental shows a slight increase. The revenue from residuals is practically the same, tar having produced more and coke less, while the loss on sulphate of ammonia in the previous year has now been turned into a slight profit. The gross profit is £21,012, being an increase of £1681. The balance from revenue account is subject to the usual deductions for income-tax, annual instalments, expenditure on mains, services, &c., and the surplus, after these deductions, is £2842, an increase of £686.

Stratford-upon-Avon.

The gross profit for the year was £5619, as against £5128, and the net profit £1387, an increase of £249. Gas sales have increased by 2,817,800 c.ft. A scheme for the provision of new plant and a new lay-out required immediately at the gas-works was approved. The estimated cost of the scheme is £5000, and it was stated by Alderman F. Ballance (Chairman of the Gas Committee) that this would be paid out of revenue. The gas fund surplus stood at present at £4089 after deduction of another sum for the relief of general rates, and they hoped to make another profit next year.

Walsall.

The net profit on the Undertaking for the past year was £2037, compared with £2023 the previous year, an increase of £14. Including £115,069 from ordinary consumers, the Undertaking's total revenue was £162,518, representing a decrease of £5933. Economies in working, however, produced savings to the amount of £3883, while interest and income-tax charges were down, with the result that there was actually a small increase in the net profit.

XUM

The Whessoe Foundry and Engineering Company, Ltd.

The Thirteenth Annual Meeting of the Whessoe Foundry and Engineering Company, Ltd., was held on June 27 at 25, Victoria Street, London, S.W. Mr. HAROLD G. JUDD, C.B.E. (Chairman of the Company), presided.

The SECRETARY (Mr. W. T. Pallin) having read the notice convening the Meeting and the Report of the Auditors,

The CHAIRMAN said: Gentlemen, the Directors' Report and Accounts have been in your hands for some days and I assume I may take them as read.

My remarks at the last Annual Meeting with reference to the conditions of industry are applicable with even more force to the year under review. It has been characterized by severe industrial depression and adverse trading conditions not only in our own country but intensified by international restrictions on export trade. As a consequence, the turnover for the year was lower than we have experienced since the formation of the Company, and as you will see from the accounts, resulted in a trading profit of only £306. This sum has been augmented by interest and dividends received £3145, and by a profit of £3150 on investments realized during the year. In addition, there has been brought in £3524, from certain internal reserves which are no longer required, making total credits of £10,127. Against this we have written off depreciation at the full normal rates and also special depreciation on certain items of plant which in our opinion it was prudent to take in at reduced figures. The total depreciation for the year thus amounts to £6448, and while this is a large sum to write off in a bad year, we are satisfied that as a result our works and plant stand at a figure which is well within their value.

After providing for Directors' Fees, Welfare and Provident Funds, and Income-Tax, there remains a surplus for the year of £331. While this amount is very small, your Directors consider it fortunate that in a year such as the one under review the Company has been able to show a surplus at all.

With regard to the Balance-Sheet, I have already explained that we are satisfied with the value standing in respect of land, buildings, and plant. Our investment in Subsidiary Companies is fully represented by liquid assets, and there is in fact a surplus over the book value even after allowing for the small loss in one Subsidiary Company referred to in the foot-note to the Balance-Sheet.

The work-in-progress and book debts amount to more than double the figure with which the year opened, and I am glad to say that these reflect a better order book than we had at the same time last year; this increase accounts mainly for the reduction in our outside investments. Moreover, while the investments realized during the year yielded the profit of £3150 to which I have referred, you will see from the Directors' Report that the market value of the remaining investments is well in excess of the book figure.

While our holding of British Government securities has been reduced, I may say that our other investments include a substantial amount of Public Authority and Trustee Stocks. We are accordingly in a strong financial position with ample liquid resources to cope with whatever increase of business we may be able to secure.

You will remember that we have a General Reserve of £40,000 which is invested in gilt-edged securities. That reserve was built up out of profits earned in more fortunate years, and at least in part was created for the purpose of equalization of dividends, or in other words to help out just such a period of slack trade as we have experienced last year. In these circumstances your Directors considered it right to take from reserve a sum of £5000 which, with the carry forward of £6304 and the year's profit of £331, makes an available balance of £11,635. Out of this we recommend the payment of a dividend of 5%, less tax, which will require a sum of £7500 and will leave to be carried forward £4135. I have little doubt that this course will commend itself to the shareholders.

In view of the contraction in our normal line of manufacture we have energetically continued our efforts to secure business in other branches of engineering work. It is too early to point to much in the way of successful results from these developments, but we have reason to expect that real benefit will accrue from the efforts devoted to this end.

While the outlook is still uncertain and business most difficult to secure, we are fortunate in having obtained a large contract for the supply and erection of Oil Storage Tanks at Haifa for the Iraq Petroleum Company. It will, I think, be of interest to shareholders to know that these tanks are all to be fitted with Wiggins Pontoon Floating Roofs which are the latest and most efficient devices for the economical and safe storage of oil. This patent Roof effects a remarkable saving in losses due to evaporation, and, moreover, practically eliminates fire risks. The tanks themselves are of interest in that the storage capacity of each tank is no less than 13,000 tons of oil.

In common with the world at large, we earnestly trust that the present Economic and Monetary Conference will result in the removal of some at least of the present hampering restrictions on trade, and will thus afford British Manufacturers a better chance of reaping the reward of their labours.

I should like to pay tribute to the loyal and energetic service rendered to the Company by the Management and staff, who, through a period of depression and difficulty, have spared no effort to maintain and extend the reputation of Whessoe.

I now conclude by moving the adoption of the Directors' Report and the Accounts, and the declaration of the dividend of 5%, less income-tax, as recommended therein.

The Hon. A. H. SEDDON CRIPPS seconded the resolution, which was carried unanimously.

The retiring Director (the Hon. A. H. Seddon Cripps) was re-elected; and the auditors (Messrs. Peat, Marwick, Mitchell, & Co.) were re-appointed.

A cordial vote of thanks to the Chairman terminated the Meeting.

PARLIAMENTARY INTELLIGENCE

[From Our Special Correspondents.]

House of Lords.

Private Bills.

The South Metropolitan Gas Bill has been reported from the Committee with amendments, and is now awaiting third reading.

The Gas Light and Coke Company Bill and the Commercial Gas Bill have been referred to a Select Committee consisting of the Earl of Cranbrook, Lord Abinger, Lord Annaly, and Lord Rhayader, with Earl Wemyss as Chairman. The Committee meets to consider the Bills on Tuesday, July 4.

Special Orders.

The following Gas Orders, having been passed by the Special Orders Committee, have been approved by the House: Northampton; Hastings and St. Leonards; and Ashburton.

The Neath Gas Order and the Herne Bay Gas Order are still awaiting consideration by the Special Orders Committee.

House of Commons.

Special Orders.

A Special Order on the application of the Hastings and St. Leonards Gas Company has been approved, subject to certain modifications.

A Special Order on the application of the Devon Gas Association, Ltd., with respect to the Ashburton Urban District, has been approved.

A Special Order on the application of the Northampton Gaslight Company has been approved.

A Special Order on the application of the Sunderland Gas Company has been approved, with certain modifications.

Taxation of Gas-Driven Motor Vehicles.

An amendment of the rate of taxation of gas-driven motor vehicles has been made.

The Minister of Transport (Mr. Oliver Stanley) said: Hon. members will recollect that in Committee the Hon. Member for Newport (Mr. Clarry) and the Hon. Member for Doncaster (Mr. Molson) raised the question of the taxation of coal gas vehicles, and I promised them that I would look into the matter, because I felt that in view of some of the facts they mentioned I had rated the immediate possibilities of this entirely new form of locomotion rather too highly. In consequence I am to-day moving certain amendments which will put the coal gas vehicle on exactly the same footing as the steam vehicle. The amendment which I now move refers to hackney carriages driven by coal gas, and later I shall move similar amendments which will extend the same concession to goods vehicles. I would, however, repeat the warning that I gave during the Committee stage—namely, that I am making this concession because of the limitation of the immediate possibilities of these vehicles. If at any time they should make such an advance as to compete on more equal terms with other forms of vehicles that are more highly taxed, it will be necessary for me to re-consider the scales now proposed.

The amendment was agreed to.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The dominating factors on the Stock Exchange last week were the wide fluctuations of the dollar exchange and the uncertainty regarding the future of America's monetary policy. Although business was somewhat less active, the underlying tone was firm, particularly in the gilt-edged section, while speculative interest was mainly centred round South African gold-mining shares and a few leading industrials. Despite the depression of last year, many of the latest annual reports have been distinctly encouraging. There have, of course, been some which have been adversely affected, but there is no doubt that given some alleviation from the present chaotic state of world currencies, a return to more prosperous conditions would not be long delayed.

The position in other sections was reflected in the Gas Market, and the volume of business was smaller last week. There was no change, however, in the general tone which remained strong, and prices with few exceptions continued unchanged. Gas Light units, which have stood at 25s. 6d. since February last, advanced 3d., and Alliance and Dublin ordinary gained a further 3 points to 125. Colonial Gas ordinary and preference shares were inquired for and rose 9d. and 1s. 6d. respectively. On the other hand, Imperial Continental declined 2 points to 205 and Plymouth and Stonehouse 1½ to 160½, while a shortening of the margin led to a fractional fall in South Metropolitan ordinary.

It is understood that the exchange of Commercial Gas ordinary stock for the new 5% debenture stock can still be made, though only a small amount of the new stock is now available. It will be remembered that this exchange is in the proportion of £96 of the 5% debenture stock for each £100 of ordinary stock, and at the current prices the capital appreciation on the exchange would amount to a little over £3%.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *June* 26.

The prices of tar products in the London market generally remain unchanged, and are at about the following levels:

Pitch, 80s. per ton f.o.b.

Creosote, 3d. per gallon.

Refined tar, 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole, 2s. 4d.; pure benzole, 1s. 9d.; solvent naphtha, 95/160, 1s. 7d.; and 90/140 pyridine bases, 4s.—all per gallon naked at makers' works.

Tar Products in the Provinces.

June 26.

The average prices of gas-works products during the week were: Gas-works tar, 32s. 6d. to 37s. 6d. Pitch—East Coast, 80s. to 82s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 80s. to 82s. 6d.* Toluole, naked, North, 1s. 9d. to 1s. 10d. Coal-tar crude naphtha, in bulk, North, 6d. to 6¼d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 10d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2d. to 2¼d.; low gravity, 1¼d.; Scotland, 2d. to 2¼d. Heavy oils, in bulk, North, 4d. to 4¼d. Carbolic acid, 60's, 2s. 9d. to 2s. 10d. Naphthalene, £9 to £10. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o b. In order to arrive at the f.a s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *June* 24.

New business is not too plentiful, but quotations are well maintained. Road tar is still leaving the works in large quantities.

Crude gas-works tar.—Actual value remains at 42s. 6d. to 47s. 6d. per ton *ex* works.

Pitch.—Export price is nominal at about 75s. to 77s. 6d. per ton f.o.b. Glasgow. Home quotations are unchanged at 75s. per ton *ex* works in bulk.

Refined tar to Ministry of Transport Specification is in large demand, and the price is steady at 3½d. to 3¾d. per gallon f.o.r. naked, according to quantity.

Creosote oil.—Quotations remain irregular, according to stocks held by each distiller. B.E.S.A. Specification is 2¾d. to 2¾d. per gallon; low gravity, 2d. to 2½d. per gallon; and neutral oil, 2½d. to 2¾d. per gallon—all in buyers' rail tanks *ex* works.

Cresylic acid.—Orders are scarce, but quotations are steadier. Pale, 97/99%, is 10d. to 11d. per gallon; dark, 97/99%, 9d. to 10d. per gallon; and pale, 99/100%, 1s. 1d. to 1s. 2d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha.—Supplies are short, and the price is steady at 4d. to 4½d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade 11d. to 1s. per gallon *ex* works.

Motor benzole —The price is higher at about 1s. 5d. per gallon *ex* works.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	9	to	0	9½	per gallon at works
Motor "	1	4	"	1	4½	" " "
Pure "	1	7½	"	1	8	" " "

Contracts Advertised To-Day.

Pipes and Specials.

Clacton Urban District Council. [942.]

Trade Notes.

Colcman Foundry Equipment Company, Ltd.

This Company announce that as from June 24 their Head Offices were removed from Southampton Street to 156, Strand, W.C. 2.

Gas Acts (1920 and 1929) Orders.

DECLARATIONS OF CALORIFIC POWER.

Burnham (Somerset) Gas Company, Ltd.

As from Oct. 1 the Company intend to supply gas of 475 B.Th.U., instead of 450 B.Th.U.

Newton-in-Makerfield Urban District Council.

The Council will supply, as from Oct. 1, gas of 430 B.Th.U., in substitution for 390 B.Th.U. as now supplied.

Gas Companies' Results in 1932.

Jersey.

At the recent annual meeting of the Jersey Gas Light Company, Mr. Harry Morris, the Managing Director, was able to report that satisfactory progress had been made during the past twelve months, as may be gathered from the fact that the gas production during 1932 reached a total of 302 million c.ft., as compared with 280 million c.ft. in the preceding year. One of the features of the past year was a marked increase in the adoption in Jersey of cookers, fires, geysers, and other household gas-using appliances, the sales of which in 1932 reached a total of no fewer than 857, as contrasted with only 595 in the preceding year. This large advance was largely due to the installation of gas fires in many hotel bedrooms, which had been fostered by the Company by the letting out on hire of slot meters. As regards public street lighting, in the early part of last year the town authorities were approached with a view to improving the lighting, which remained as it was installed on the cessation of the war in 1918. An offer was made by the Company to replace the existing single inverted burners by twin burners and multi-ray reflectors, and providing more than four times the effective illumination with each lamp. The Parish, after demonstrations of the proposed lighting, agreed to install it throughout St. Helier, and at the same time to install 87 extra lamps in the streets and to enter upon a new contract for five years, as from the end of September, 1932. The work was immediately proceeded with and put in operation before the end of the year. Advantage was also taken, when converting the public lighting lamps, to install clock controllers throughout the Parish, these having previously been found to be successful in the outlying districts. Since then both the Parishes of St. Saviour and St. Clements have fallen into line with St. Helier, so that the whole of the public lighting undertaken by the Jersey Company is now clock controlled.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. June 24. (Provincial Exchanges June 23.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Apl. 3	7⅞	7	Alliance & Dublin Ord. ...	120—130	+3	...
374,000	,,	Jan. 9	4	4	Do. 4 p.c. Deb. ...	85—95	...	...
557,655	,,	Mar. 6	7	7	Barnet Ord. 7 p.c.	157—162	...	161
300,000	1	May 8	1/4⅛	1/9⅜	Bombay, Ltd.	25/—27/-	...	26/-
178,280	Stk.	Feb. 20	9½	9½	Bournemouth sliding scale	195—205	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	157—162	...	...
439,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	137—142	...	...
50,000	,,	Dec. 19	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	101—106	...	...
210,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	122—127	...	...
357,900	,,	Mar. 6	7½	7½	Brighton, &c. 6 p.c. Con. ...	152—157	...	...
540,000	,,	,,	6½	6½	Do. 5 p.c. Con. ...	142—147	+1	141½—145½
195,500	,,	,,	6	6	Do. 6 p.c. B Pref.	134—137	...	...
1,487,500	,,	Mar. 6	5	5	Bristol 5 p.c. max.	111—113*a*	−1	...
120,420	,,	Dec. 19	4	4	Do. 1st 4 p.c. Deb. ...	100½—101¼*a*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	100½—101¼*a*	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	120—124*a*	...	...
855,000	,,	Apl. 3	7	8	British Ord.	147—152	...	149—150½
100,000	,,	Dec. 19	7	7	Do. 7 p.c. Pref.	147—152	...	...
350,000	,,	,,	—	5½	Do. 5½ p.c. Pref. ...	105—110	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	105—115	...	...
160,000	,,	Jan. 9	5	5	Cambridge 5 p.c. Deb. ...	117—122	...	...
100,000	10	May 22	6	4	Cape Town, Ltd.	7—8	...	7⅞—7½
100,000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref. ...	6—7	...	...
150,000	Stk.	Dec. 19	4½	4½	Do. 4½ p.c. Deb. ...	88—93	...	...
626,860	,,	Feb. 20	6	6	Cardiff Con. Ord.	119—124	...	...
237,860	,,	Jan. 9	2½	5	Do. 5 p.c. Red. Deb.	107—112	+2	...
157,150	,,	Feb. 20	5	6½	Chester 5 p.c. Ord.	105—110*b*	...	...
98,986	1	May 22	2/-	2/-	Colombo, Ltd. Ord.... ...	25/—30/-	...	...
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	18/6—20/6	...	...
609,204	1	Mar. 20	/11'48	/11'48	Colonial Gas Assn. Ltd. Ord.	17/6—20/-	+·/9	...
296,053	1	,,	1/3'30	1/3'30	Do. 8 p.c. Pref.	1 1/16—1 3/16	+1/6	...
1,796,955	Stk.	Feb. 20	3	6½	Commercial Ord.	112—117	...	114
475,000	,,	June 12	3	3	Do. 8 p.c. Deb. ...	74—79*	...	...
265,272	,,	Mar. 6	—	5	Do. 5 p.c. Deb. ...	120—125	...	...
807,560	,,	Feb. 20	7	7	Croydon sliding scale ...	145—150	...	148—149
469,590	,,	,,	5	5	Do. max. div.	101—106	...	103—104½
500,000	,,	Jan. 9	5	5	Do. 5 p.c. Deb.	120—125	...	...
542,270	,,	Mar. 6	7	10	Derby Con.	150—160*c*	...	...
55,000	,,	Jan. 9	4	4	Do. 4 p.c. Deb.	80—85*c*	...	...
209,000	,,	Mar. 6	5	5	East Hull Ord. 5 p.c. ...	106—111	...	...
179,500	,,	Mar. 6	6	6	East Surrey Ord. 5 p.c. ...	120—125	...	...
155,019	,,	Dec. 19	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
1,002,180	,,	Apl. 3	†5	†7	European, Ltd.	128—133	...	130½—131½
19,378,992	,,	Feb. 20	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	25/3—26/3*f*	+·/3	25/9—26/1½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. ...	85—88	...	85½—86½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	99—102	...	99½—101
6,102,497	,,	June 12	3	3	Do. 3 p.c. Con. Deb. ...	76—79*	...	76½—78
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	112—115*	...	114½
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	108—111*	...	109—110½
270,466	,,	Mar. 6	6	6	Harrogate New Cons. ...	113—118	...	...
82,500	,,	Mar. 6	7	7	Hastings & St. L. 5 p.c. Conv.	138—143	...	...
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	110—115	...	114½
70,000	10	Apl. 24	†10	†10	Hongkong & China, Ltd. ...	14—15	...	...
213,200	Stk.	Mar. 6	6	6	Hornsey Con. 3½ p.c. ...	122—127	...	...
5,600,000	,,	May 22	10	14	Imperial Continental Cap.	200—210	−2	205½—208
223,180	,,	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb.	89—94	...	...
235,242	,,	Mar. 6	3½	3½	Lea Bridge 5 p.c. Ord. ...	170—175	...	...
2,145,907	,,	Mar. 6	6	6	Liverpool 5 p.c. Ord. ...	125½—126½*b*	...	...
245,500	,,	Dec. 19	5	5	Do. 5 p.c. Red. Pref. ...	105—115*b*	...	...
306,083	,,	Jan. 19	4	4	Do. 4 p.c. Deb. ...	101—103*b*	...	...
165,786	,,	Feb. 20	8	10	Maidstone 5 p.c. Cap. ...	180—200	...	...
56,176	,,	Dec. 19	3	3	Do. 3 p.c. Deb. ...	70—75	...	...
75,000	£	June 12	†10	†10	Malta & Mediterranean ...	9—11*	...	...
392,000	—	Apl. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	98—103	...	...
231,978	Stk.	Mar. 6	5	5	M. S. Utility "C." Cons. ...	103—108	...	...
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	93—98	...	...
112,126	,,	Jan. 9	4	4	Do. 4 p.c. Deb. ...	102—104	...	...
148,955	,,	,,	5	5	Do. 5 p.c. Deb. ...	115—120	...	...
675,000	,,	21 May '31	†6	†6	Montevideo, Ltd.	50—60	...	...
2,061,315	,,	Mar. 6	5	5⅝	Newcastle & Gateshead Con.	24/6—25/6*d*	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	99—101*d*	...	...
776,706	,,	Jan. 9	3½	3½	Do. 3½ p.c. Deb. ...	91—93*d*	...	...
277,285	,,	May 8	5	5	Do. 5 p.c. Deb. '42...	107—109*d*	...	...
274,000	,,	Feb. 20	5	5	Newport (Mon.) 5 p.c. max.	101—103*a*	...	...
204,940	,,	Mar. 20	7½	7½	North Middlesex 6 p.c. Con.	137—143	...	...
396,160	,,	Feb. 6	5	5	Northampton 5 p.c. max. ...	103—108	...	...
300,000	,,	Apl. 24	9	7	Oriental, Ltd.	114—119	...	...
316,617	,,	Dec. 19	8	8	Plym'th & Stonehouse 5 p.c.	158—163	−1½	160½
504,416	,,	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std.	161—166	...	165
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	104—109	...	...
114,000	,,	Feb. 20	5	5	Preston 5 p.c. Pref.	103—108	...	...
686,312	,,	Jan. 23	4	4	Primitiva 4 p.c. Rd. Db. 1911	80—85	...	...
389,813	,,	Dec. 19	4	4	Do. 4 p.c. Cons. Deb.	80—85*d*	...	...
150,000	10	Mar. 20	6	6	San Paulo 6 p.c. Pref. ...	6⅞—7⅛	...	...
1,736,968	Stk.	Sept. 5	6	6	Sheffield Cons.	123—127*e*	...	...
95,000	,,	Jan. 9	4	4	Do. 4 p.c. Deb.	91—95*e*	...	...
133,201	,,	Feb. 20	5	5	Shrewsbury 5 p.c. Ord. ...	125—130	...	...
90,000	10	June 12	15	14	South African	3—5*	...	...
6,709,895	Stk.	Feb. 20	5	7	South Met. Ord.	123—126	−½	124—125½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	135—140	−1	138
850,000	,,	,,	—	20/-*g*	Do. 4 p.c. Irred. Pf.	99—103	...	100½—101
1,895,445	,,	Jan. 9	3	3	Do. 3 p.c. Deb. ...	77—80	...	77½—79
1 000,000	,,	Jan. 23	5	5	Do. 5 p.c. Red. Deb.	112—116	...	...
209,820	,,	Mar. 6	8½	8½	South Shields Con.	147¼—152½*d*	...	...
1,543,795	,,	Feb. 20	6	6	South Suburban Ord. 5 p.c.	124—129	...	126½
300,000	,,	,,	5	5	Do. 5 p.c. Pref.	113—118	...	114—115
868,837	,,	Dec. 19	5	5	Do. 5 p.c. Deb.	120—125	...	122½—123
647,740	,,	Feb. 20	5	5	Southampt'n Ord. 5 p.c. max.	107—112	...	...
121,275	,,	Dec. 19	4	4	Do. 4 p.c. Deb.	100—105	...	...
350,000	,,	Mar. 6	9/-	5½	Swansea 5½ p.c. Red. Pref.	108—112	...	111½—112
200,000	,,	Dec. 19	6½	6½	Do. 6½ p.c. Red. Deb.	105—110	...	...
1,076,490	,,	Mar. 6	6½	6½	Tottenham and District Ord.	142—147	...	...
300,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	123—128	...	126½
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...	...
199,005	,,	June 12	4	4	Do. 4 p.c. Deb. ...	96—101*	...	...
85,701	,,	Apl. 3	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	80—85	...	...
347,769	,,	Mar. 6	7	7	Uxbridge, &c., 5 p.ct. ...	140—145	...	...
88,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	110—115	...	114
1,322,220	,,	Mar. 6	7	7	Wandsworth Consolidated	145—150	...	145½—148
1,096,373	,,	,,	5	5	Do. 5 p.c. Pref.	112—117	...	114½
1,317,964	,,	Dec. 19	5	5	Do. 5 p.c. Deb.	120—125	...	122
158,400	,,	Mar. 6	5	6A	Winchester W.&G.5p.c.Con.	109—114	...	111

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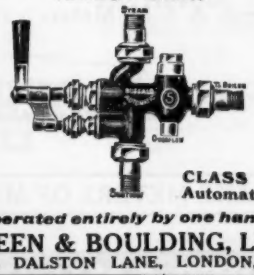

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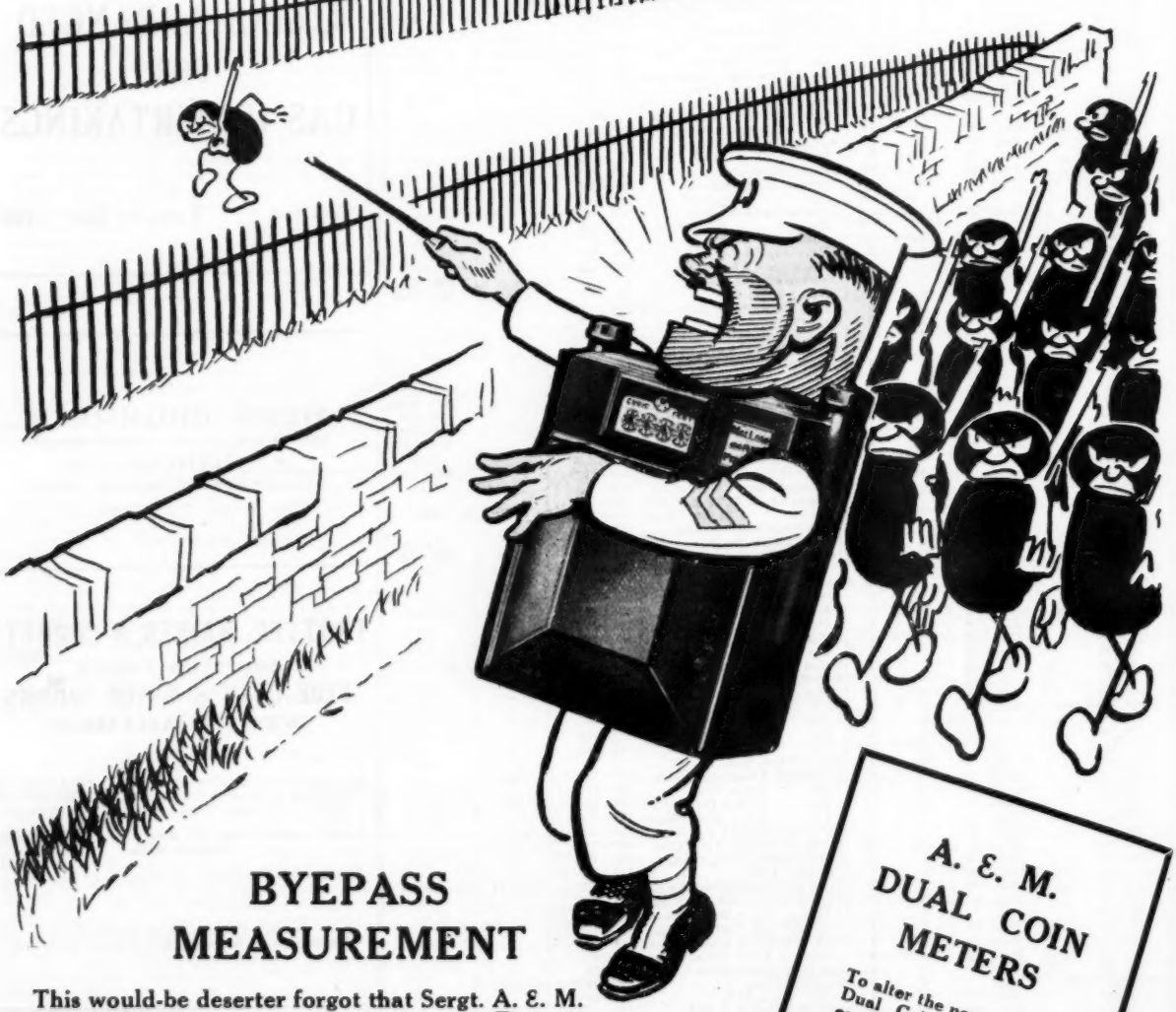

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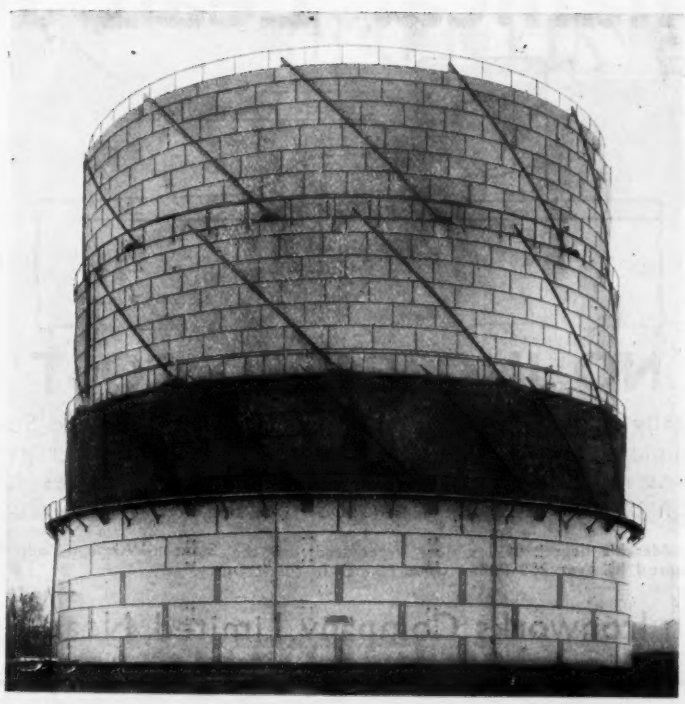

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(Continuation of small adverts. on p. 942.)

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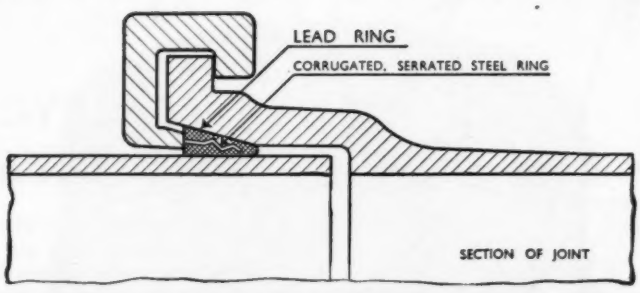

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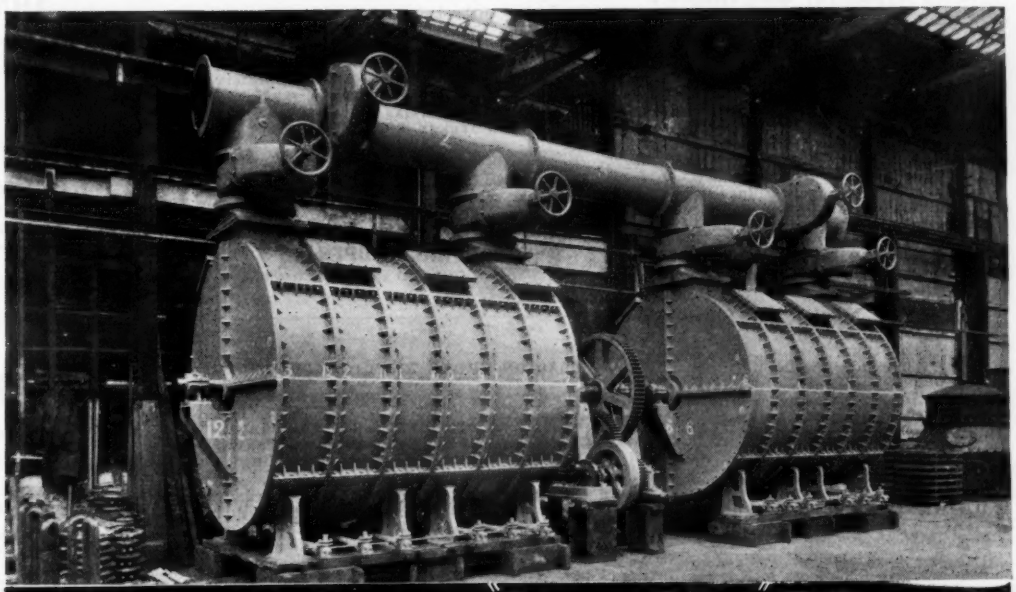

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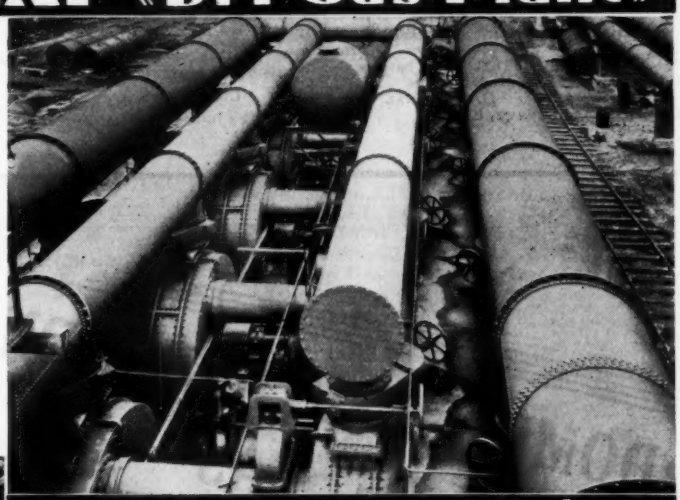

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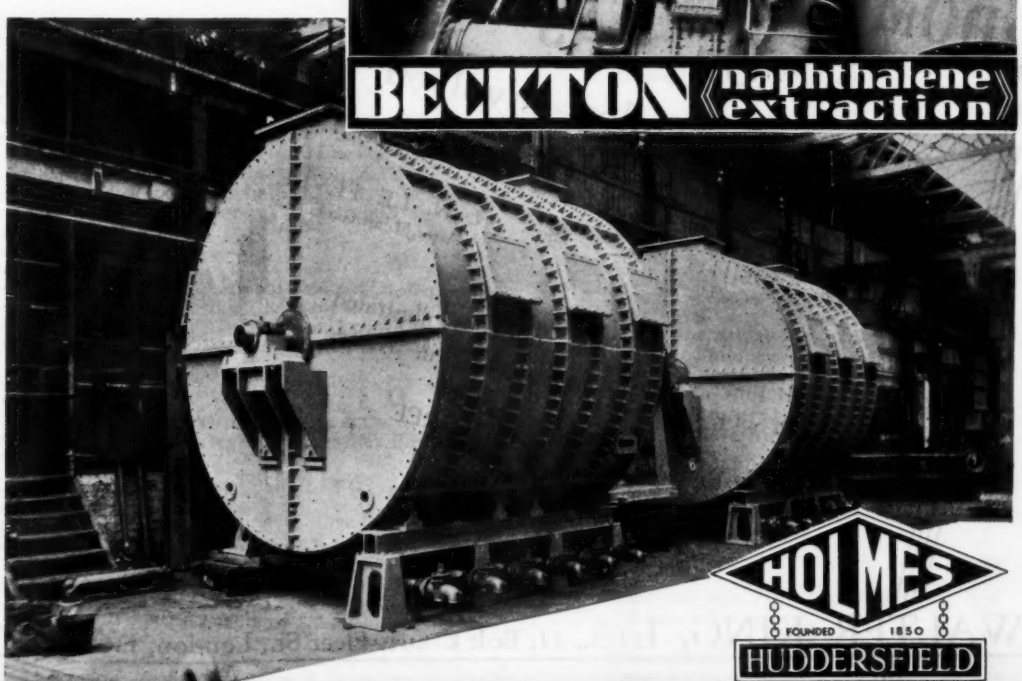

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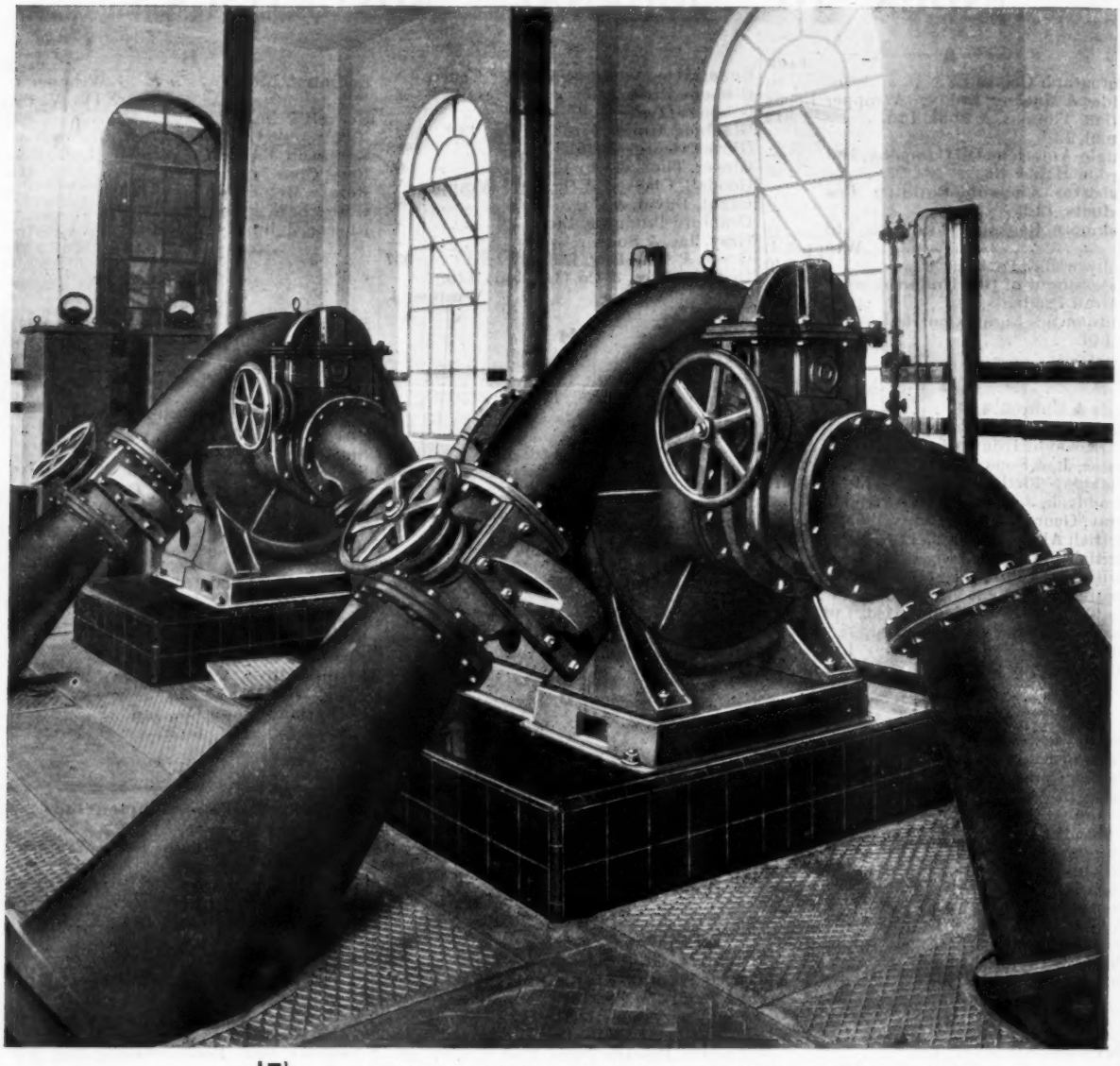

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THE JOHN CRE

GAS JOURNAL

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A.E.M. METERS
ON PAGE 938

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Purifying Material from STOCK.
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SPECIFY
"BLUEBELL" 95% SILICA
(In use in over 60 installations).
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HOLMES
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Previous Announcement June 21.

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ASHMORE, BENSON, PEASE & Co. Ltd.
STOCKTON-ON-TEES
SEE ADVERTISEMENT LAST WEEK, PAGE 832

NATURAL STEEL GREY
FERRODOR
PAINT
FOR GAS HOLDERS
Made with "Ferrodor" Ore — an indestructible, flaky pigment which interleaves and forms a perfect protective coating against corrosion.
Griffiths Bros. & Co. London Ltd.
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ESTABLISHED 1840.

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DESIRABLE DEPENDABLE AND DURABLE
HEAD OFFICE: GAS PLANT WORKS MANCHESTER
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See Pages
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METRO DISINFECTANT FLUID

A HIGHLY CONCENTRATED TAR ACID EMULSION,
MISCIBLE WITH SOFT, HARD OR SEA-WATER.

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A PROTECTIVE COVERING FOR ALL OUTDOOR IRONWORK—TO DRY QUICKLY WITH A GOOD HARD GLOSS.

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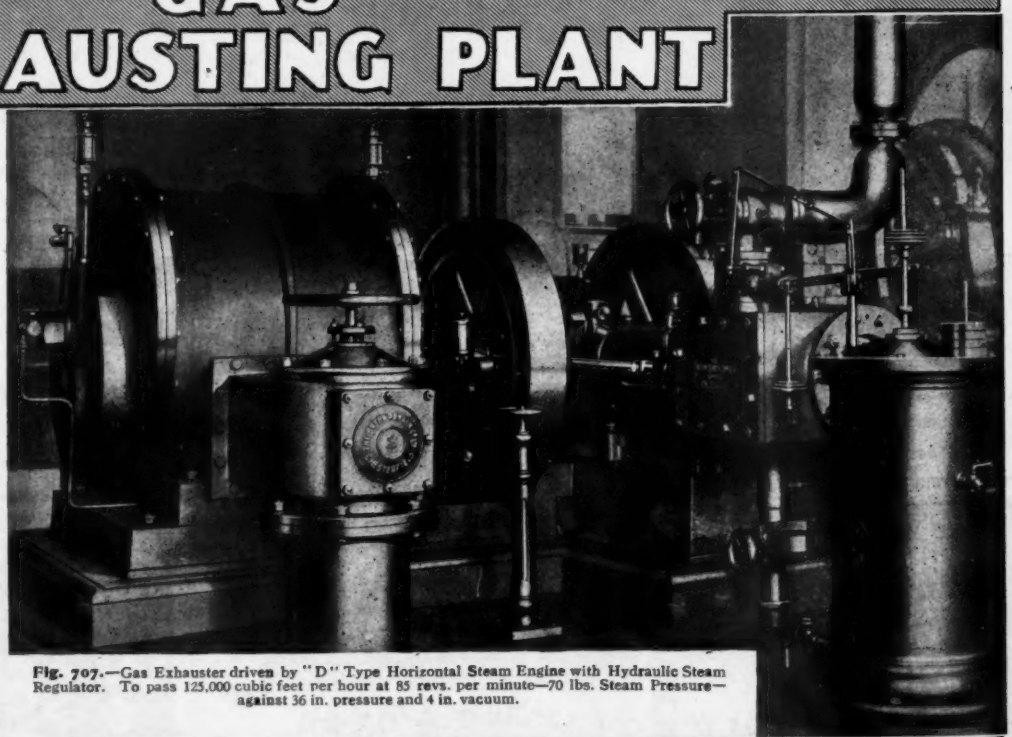

Fig. 707.—Gas Exhauster driven by "D" Type Horizontal Steam Engine with Hydraulic Steam Regulator. To pass 125,000 cubic feet per hour at 85 revs. per minute—70 lbs. Steam Pressure—against 36 in. pressure and 4 in. vacuum.

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W-D

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Some installations erected

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WITH ANNUAL MAKES OF **60 MILLION** CUBIC FEET OF GAS AND UNDER.

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EACH RETORT IS A SEPARATE HEATING & SCURFING UNIT

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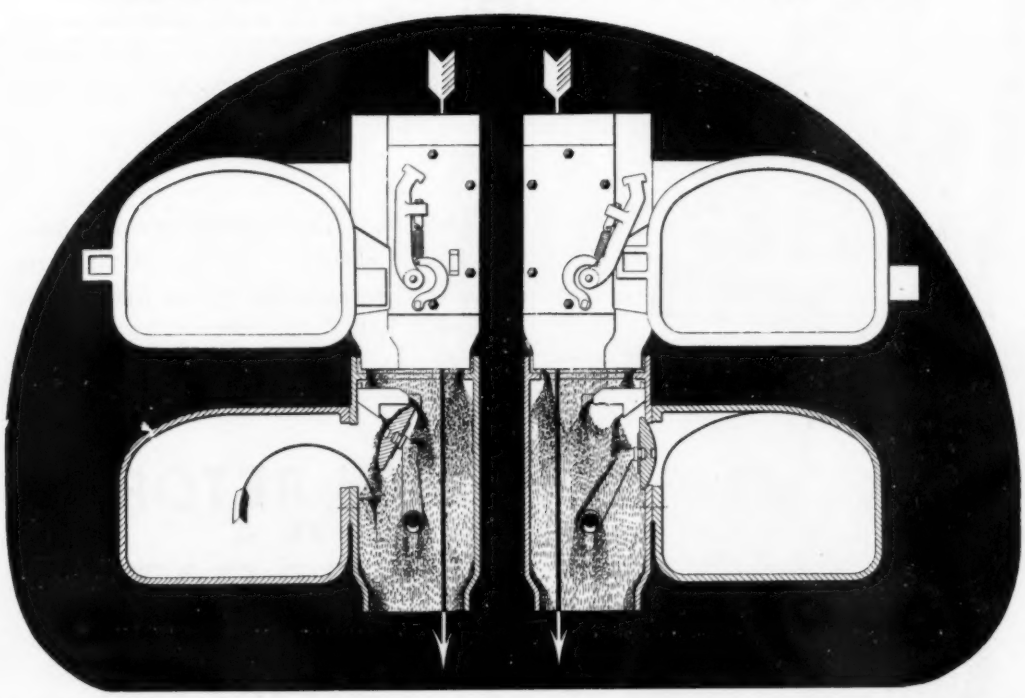

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THREE SIZES & A TABLE MODEL

The Calthorpe oven is enamel-lined with swinging gates, sliding grids and syphon flue. The new dome door has cam-action latch. The hotplate, with three or four boiling burners and grill, has flat-top bars on which pans and kettles do not tip. This cooker incorporates every refinement in design and is supplied in silver grey and coloured porcelain enamel finishes. The Calthorpe is now widely advertised in the leading Home Journals.

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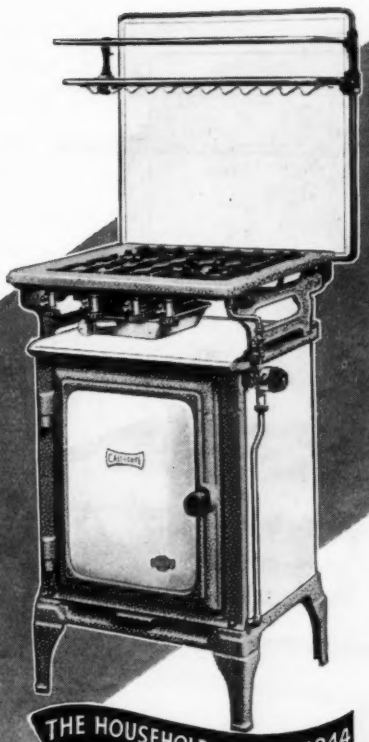
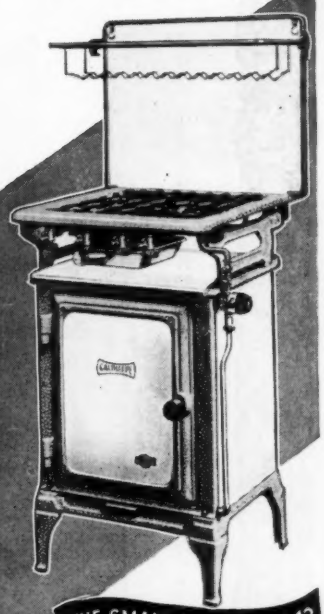


THE HOUSEHOLD MODEL · Nº 244



THE SMALL MODEL · Nº 242

The Calthorpe small model No. 242 has oven 15″ wide inside; hotplate with three boiling burners and one grill. It is ideal for the smaller villa, flat, or kitchenette.

The Household Calthorpe Model No. 244 is the most popular size for average homes, and is the model recently tested and praised by the Good Housekeeping Institute of Hygiene in London. Oven is 16½″ wide inside; hotplate with three boiling burners and one grill.

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THE TABLE MODEL · ·
An Extra Capacity Cooker

AJUSTO CONTROL.

The Patent Ajusto Oven Control gives perfect automatic cooking. It has several special features. The filter, which ensures perfect valve action, is easily removed for cleaning. Only one visible indicator number on dial makes for easy reading; the Bakelite handle is moulded, facilitating setting.

PARKINSON

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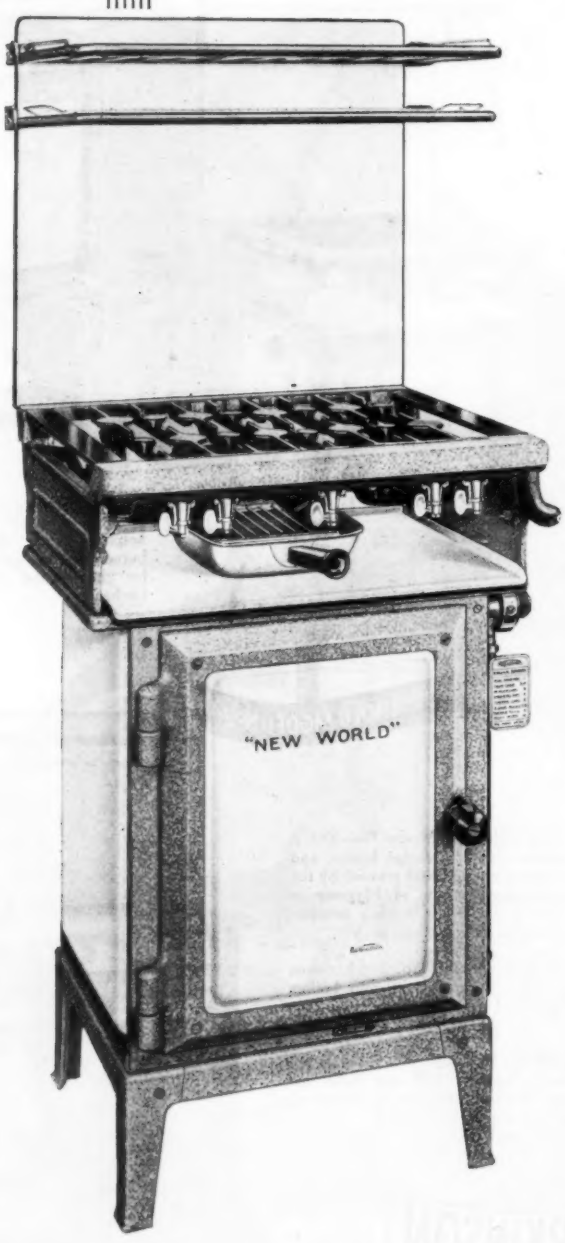

"Success with everything you cook in the oven . . . every time."

Introduced as far back as 1923, the "New World" "Regulo"-controlled cooker was an original, distinct advancement against the background of all other cookers. Since then, its margin of leadership has widened daily through the experience of the increasing number of "New World" users.

THE "Regulo" (trade mark) device for the control of the heat of the oven automatically, was introduced by Radiation Ltd., and is incorporated only in the "New World" Cookers made by the associated Radiation Companies. For ten years its simplicity and unfailing good service have established it among the Public as the greatest boon of the century, and, in consequence, the "New World" "Regulo"-controlled cookers and ranges enjoy a popularity that has brought gas cooking right into the forefront of the Public mind.

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. . . . . For the "New World" is in a class by itself!

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GAS COOKERS

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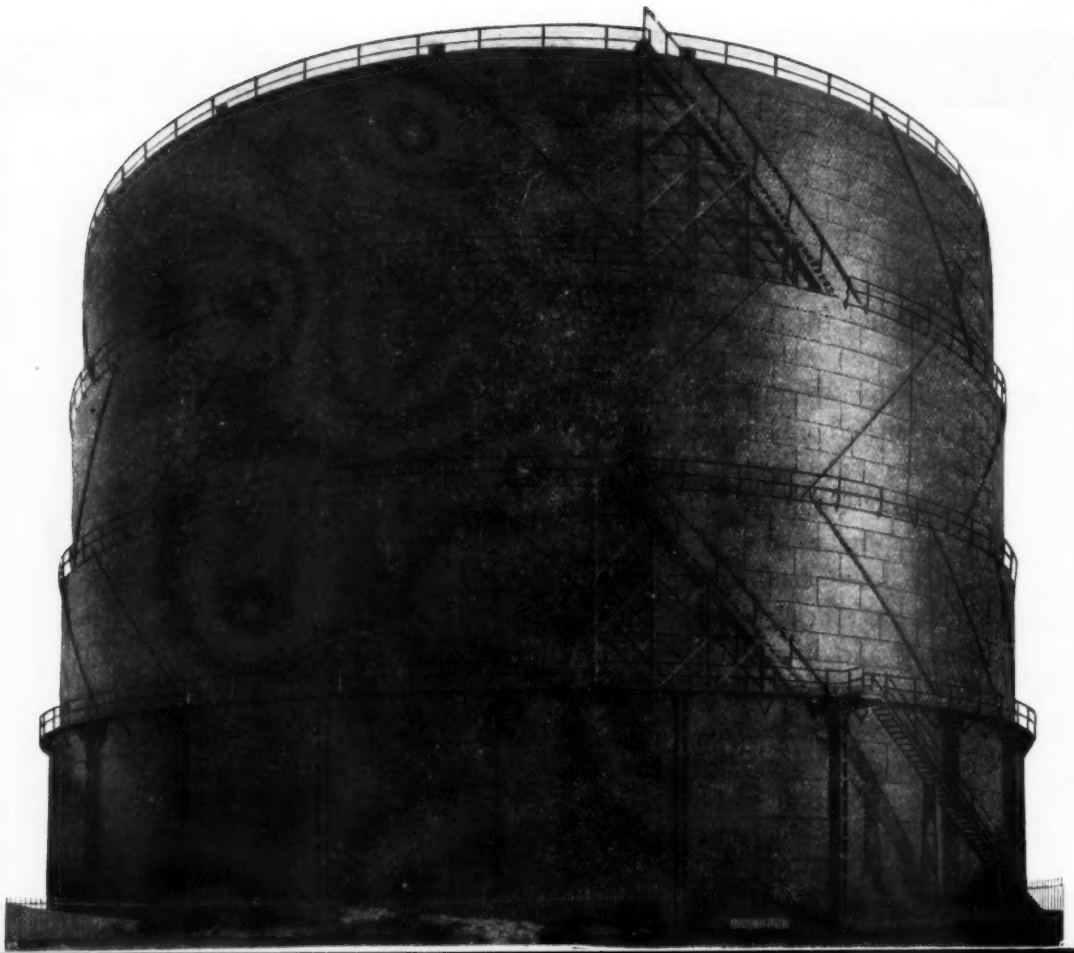

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OF MODERN IMPROVED TYPE

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NEWTON CHAMBERS & CO LTD
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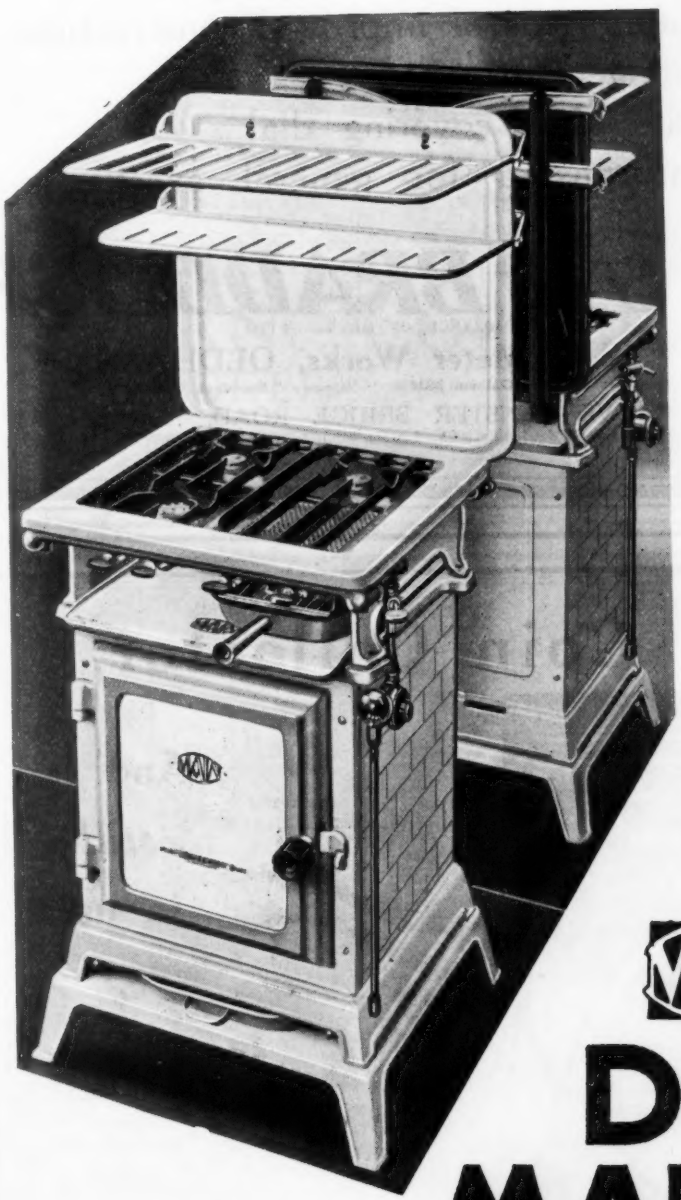
—back as well as front, and inside as well as outside.



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THE AUTOMATIC OVEN CONTROL ASSURES ECONOMICAL AND EFFICIENT COOKING SERVICE

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General Gas Appliances Ltd.
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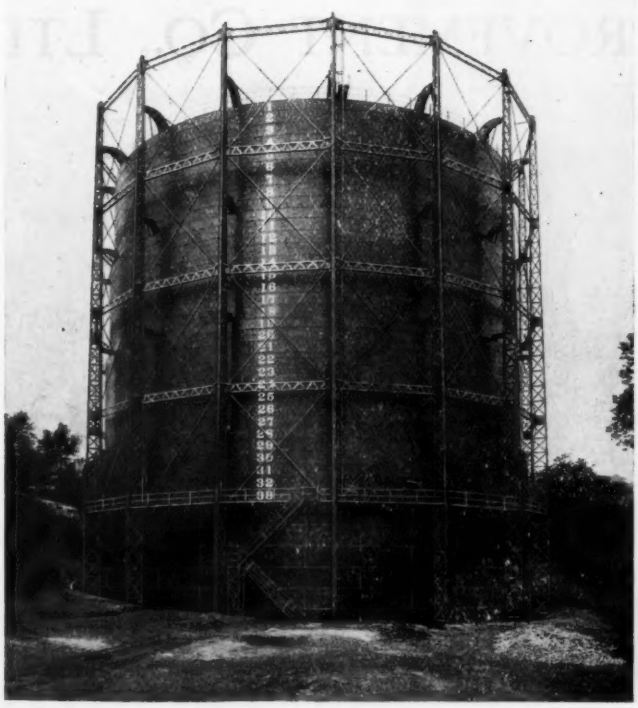

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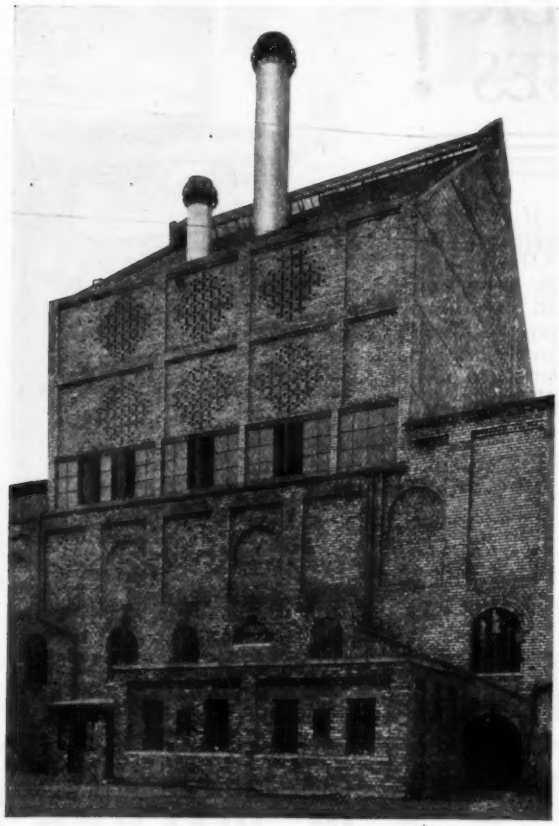

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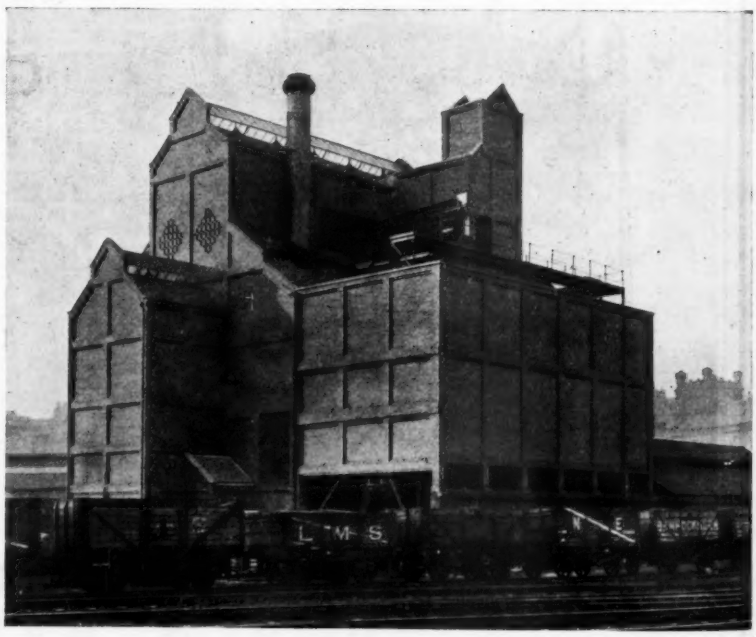

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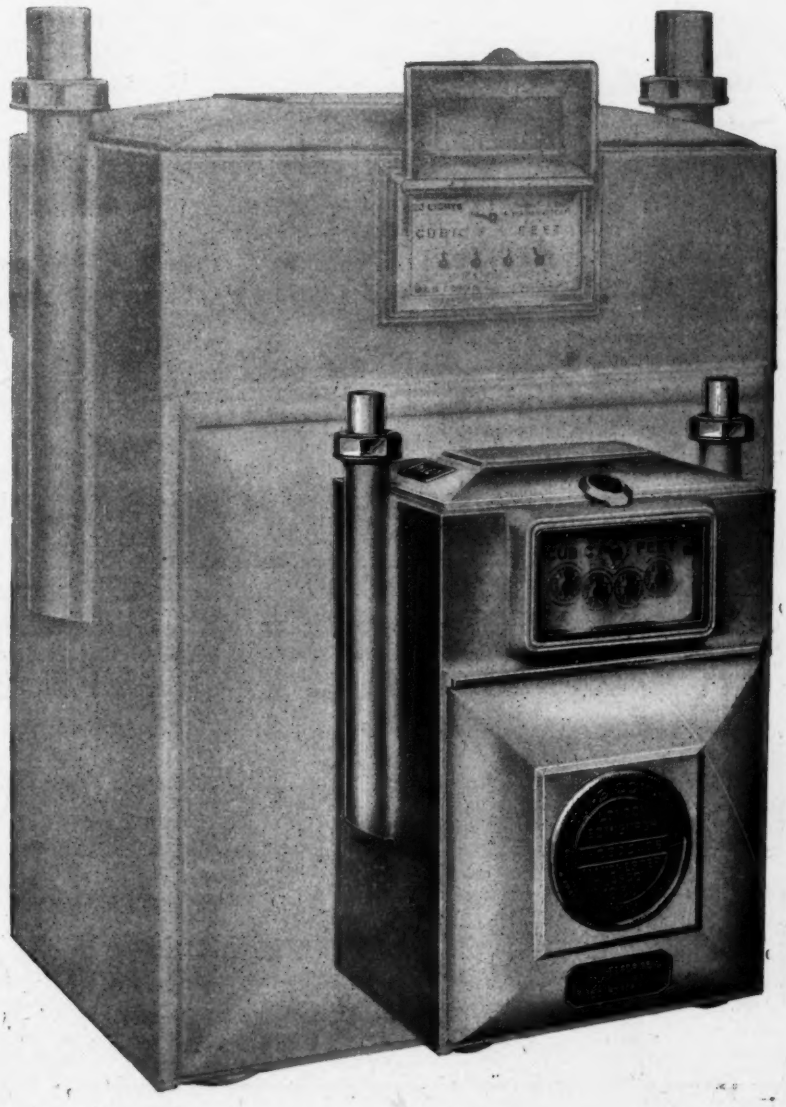
COWAN HIGH CAPACITY METERS

Advantage No. 1.

The first advantage is the small size in proportion to the volume of gas accurately measured.



The illustration above demonstrates the size advantage of the Cowan Small High Capacity Meter as compared with the ordinary type.

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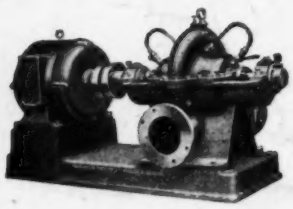

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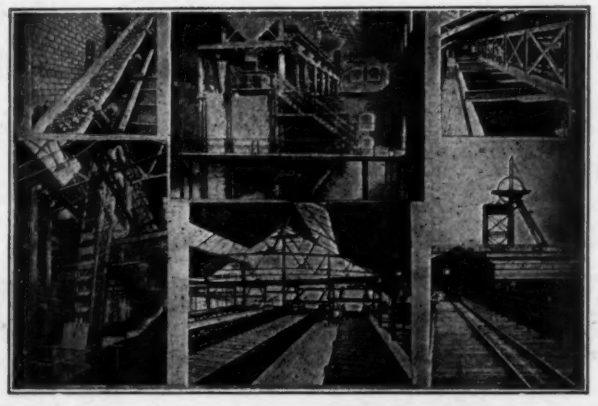

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